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ABSTRACTS 1725-1922

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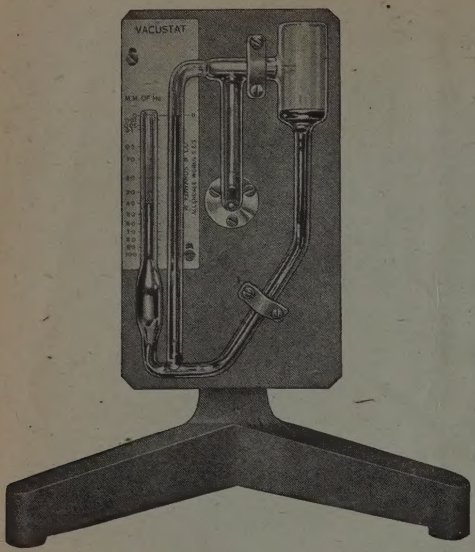

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6.055.5(71) 1725

Twenty-sixth Annual Report of the National Research Council, 1942–43. *A.R. Nat. Res. Coun. Can.*, 5 *pp.*, 1942–1943.

1 : 581.4 : 591.4 1726

Studies in the physico-mathematical theory of organic form. RASHEVSKY, N. *Bull. Math. Biophys.*, , *pp.* 1–59, *Jan.*, 1944.—[See Abstr. 2280, 2281, 2290 (1943)]. A theory of the form of plants is developed showing how the mechanical strength, total mass and metabolism may determine the general form of the plant and also such details as the number, size, shape and shades of the leaves. The form of animals, as required by mechanical conditions and the types of possible locomotions, is discussed and a theory of the movement of snakes in relation to their length is outlined. The form and locomotion of quadrupeds and the theory of flight of birds and insects are discussed. A comparison with available observations is made. A set of equations is outlined which determines not only the external shape but also the internal structure of animals. Curves are given showing the variation (with the mass of the animal) of the heart frequency, mass of heart, mass of lungs and frequency of breathing. L. S. G.

512.894.4 : 513.65 1727

The geometry of the binary quintic form. TODD, J. A. *Proc. Camb. Phil. Soc.*, 40, *pp.* 1–5, *March*, 1944.—A geometrical interpretation is given of the 23 irreducible concomitants of the binary quintic, using the n.r.c. R^5 in [5] and its projection R'^5 on to a prime as a foundation. L. S. G.

512.97 : 513.84 *see Abstr.* 1729

513.65 : 512.894.4 *see Abstr.* 1727

513.735.92 = 4 1728

The geodesic lines on a convex surface of positive Gaussian curvature. LIBERMAN, J. *C.R.* (*Doklady*) *Acad. Sci. URSS*, 33, 1, *pp.* 9–11, 1941.—A proof is given of the theorem: there exists a positive number N such that each segment of a geodesic having a length greater than N has intersection with itself. L. S. G.

513.84 : 512.97 1729

Geometric figures in affine space. SPENCER, D. E. *J. Math. Phys.*, 23, *pp.* 1–23, *Feb.*, 1944.—A short note is given on the elements of projective space (using tensor notation) and the passage from projective to affine space. Geometric figures represented by contravariant and co-variant tensors of valence 1 are discussed and simple combinations of these give figures represented by tensors of valence 2. Among the combinations are found the affine ancestors of all the figures of Study. The paper leads to a more basic understanding of Study's work, especially his "Geometrie der Dynamen." L. S. G.

517.23 : 518.12 1730

Coefficients for numerical differentiation with central differences. SALZER, H. E. *J. Math. Phys.*, 22, *pp.* 115–135, *Sept.*, 1943.—Extensive tables are given of the coefficients $A^n_{2\nu-1}$ and $A^n_{2\nu}$ in the formula for the nth derivative in terms of central differences, namely

$$\omega^n\phi^{(n)}(u_0) = \sum_{\nu=(n+1)/2}^{k} A^n_{2\nu-1}\square\delta_0^{2\nu-1} + R_1 \ (n \text{ odd}),$$

$$= \sum_{\nu=n/2}^{k} A^n_{2\nu}\delta_0^{2\nu} + R_2 \ (n \text{ even}),$$

where ω is the tabular interval and $\square$ is the operator $(E^{1/2}+E^{-1/2})/2$. The coefficients are given for derivatives as far as the 52nd, and as far as the 42nd difference or further. For the first 30 derivatives exact (fractional) values are given for coefficients of the first 30 differences. L. S. G.

517.392 : 517.512.2 *see Abstr.* 1731

517.512.2 : 517.392 1731

Table of Fourier coefficients. LOWAN, A. N., AND LADERMAN, J. *J. Math. Phys.*, 22, *pp.* 136–147, *Sept.*, 1943.—Tables are given to 10 decimal places of $\int_0^1 x^k \sin n\pi x dx$ and $\int_0^1 x^k \cos n\pi x dx$ for $k = 1, 2, 3, \ldots, 10$ and $n = 1, 2, 3, \ldots, 100$. These facilitate the evaluation of the first hundred Fourier coefficients of a function $\phi(x)$ which can be represented by a polynomial of degree $\not> 10$. L. S. G.

517.512.4 : 518.2 1732

Tables of $f_n(x) = \dfrac{n!}{(x/2)^n} J_n(x)$. **Mathematical Tables Project.** *J. Math. Phys.*, 23, *pp.* 45–60, *Feb.*, 1944.—Tables of $f_n(x)$ are given to 9 decimal places for the range $2 \leqslant n \leqslant 20$. For $n = 2$ and 3 the range of x is 0 (·05) 10; for $n = 4$ and 5 the range is 0 (·05) 6·50 (·1) 10; for $n = 6$, 7 and 8 the range is 0 (·05) 1·50 (·1) 10; and for $n \geqslant 9$ the range is 0 (·1) 10. Modified second central differences are tabulated alongside the entries. L. S. G.

517.544 : 532.517 *see Abstr.* 1763

517.93 = 4 1733

On a limit problem in the theory of non-linear differential equations. LUSTERNIK, L. *C.R.* (*Doklady*) *Acad. Sci. URSS*, 33, 1, *pp.* 5–8, 1941.—The equation studied is $y'' + \phi(x, y, y') + \lambda y = 0$ where ϕ is continuous and satisfies the conditions (1) $\phi(x, -y, -y') = -\phi(x, y, y')$, (2) $|\phi(x, y, y')| \leqslant N(|y|^{4-\varepsilon} + |y'^{8/3-\varepsilon}+1)$, N and ε being fixed pos. numbers. The following theorem is proved: For each ϕ satisfying these conditions and for each positive integer k there exists at least one solution of the original equation such that $y(a) = y(b) = 0$, $\int_a^b y^2 dx = 1$ and $y(x)$ has $(k-1)$ zeros in the interval (a, b). L. S. G.

517.933.2 : 519.3 1734

Characterization of the system of extremals of variation problem of higher order in the plane. KARLIN, M. *J. Math. Phys.*, 22, *pp.* 158–180, *Sept.*, 1943.—An ∞^4 family of curves in the plane (x, y) is given by the differential equation $y'''' = F(x, y, y', y'', y''')$. It is shown that these curves can be identified with the totality of extremals of some variation problem $\int\phi(x, y, y', y'')dx = \text{min.}$, if, and only if, $F(x, y, y', y'', y''')$ is of the form $A + By''' + C(y'')^2$ where A, B and C are functions of x, y, y' and y'' obeying a certain set of 6 differential equations. In this case it is actually possible to find the corresponding function ϕ which is essentially unique.

Some results are also obtained for the corresponding third-order problem where ∞^6 curves are defined by an equation of order six. L. S. G.

517.948 1735

The solution of linear operator equations. MURRAY, F. J. *J. Math. Phys.*, 22, *pp.* 148–157, *Sept.*, 1943.—A method is given for solving the equation $Tf = g(y)$ where $Tf = \int_0^{2\pi} k(x, y)f(x)dx$, $g(y)$ and $k(x, y)$ being given complex functions. We denote by (f, g) the integral $\int_0^{2\pi} f(x)\overline{g}(x)dx$ and by T^* the adjoint operator to T. Let $\chi_1, \chi_2, \ldots$ be a complex orthonormal set. Form $T^*\chi_1, T^*\chi_2, \ldots$ and orthonormalize these into $\phi_1, \phi_2, \ldots$ Let ω_n be such that $\phi_n = T^*\omega_n$. Form $T\phi_1, T\phi_2, \ldots$ and orthonormalize into $\psi_1, \psi_2, \ldots$ The necessary and sufficient conditions that there exist an f such that $Tf = g$ are (1) $g = \sum_{n=1}^{\infty} y_n\psi_n$ or $(g, g) = \sum_{n=1}^{\infty} |(g, \psi_n)|^2$; (2) $\sum_{n=1}^{\infty} |(g, \omega_n)|^2 < \infty$. When these are satisfied, we have $Tf_0 = g$, where $f_0 = \sum_{n=1}^{\infty} (g, \omega_n)\phi_n$. If f is any other solution, then $f = f_0 + h$ where $Th = 0$. The paper also includes a discussion of the structure of linear operators and the limitations of the above method. A numerical example is given. L. S. G.

518.12 : 517.23 *see Abstr.* 1730

518.2 : 517.512.4 *see Abstr.* 1732

518.3 : 667.2 : 535.663 *see Abstr.* 1803

518.4 1736

Graphical computation. HANSEL, C. W. *Phil. Mag.*, 35, *pp.* 159–169, *March*, 1944.—In an example, treated in detail, it is shown that ten charts similar to the one described give direct and inverse readings of logs, reciprocals, trig. functions and their logarithms to five-figure accuracy. Another figure which combines a nomogram and a graphical table, permits the computation of x^a where x and a are real positive numbers. L. S. G.

518.5 : 545.822 *see Abstr.* 1876

518.61 : 532.525 1737

Relaxation methods applied to engineering problems. IX. High-speed flow of compressible fluid through a two-dimensional nozzle. GREEN, J. R., AND SOUTHWELL, R. V. *Philos. Trans. A.*, 239, *pp.* 367–386, *April* 17, 1944.—Previously developed methods [Abstr. 1996 (1940)] are used to solve the flow problem for a convergent-divergent nozzle of any specified shape, and solutions of sufficient accuracy for practical purposes are obtained when the velocity of the fluid nowhere exceeds the local speed of sound. When this condition is not satisfied, the computed velocities fail to converge. The reason for this is discussed and an alternative method is proposed but no details are given. It is possible to treat nozzles of arbitrary shape, because a curvilinear net may be obtained from a rectangular net by means of a conformal transformation. The numerical example given is the case of air started from rest in a reservoir where the temperature and pressure are 15°C. and 100 lb./in.^{2} (abs.). For the shape of the nozzle see Abstr. 2656 B (1938). L. S. G.

519.27 1738

An extension of Wilk's method for setting tolerance limits. WALD, A. *Ann. Math. Statist.*, 14, *pp.* 45–55, *March*, 1943.—Let $x_1, \ldots, x_p$ be a set of p random variables with continuous probability density function $f(x_1, \ldots, x_p)$ (unknown). A sample of n independent observations is drawn and the αth observation on x_i is $x_{i\alpha}(i = 1, \ldots, p; \alpha = 1, \ldots, n)$. The problem of setting tolerance limits for $x_1, \ldots, x_p$ is: For some given positive values $\beta < 1$ and $\gamma < 1$ we have to construct p pairs of functions $L_i(x_{11}, \ldots, x_{pn})$ and $M_i(x_{11}, \ldots, x_{pn})(i = 1, \ldots, p)$ such that the probability that $\int_{L_p}^{M_p} \ldots \int_{L_1}^{M_1} f(t_1, \ldots, t_p)dt_1 \ldots dt_p \geqslant \gamma$, holds is equal to β. This problem is solved for the bivariate case and for multivariate distributions. L. S. G.

519.283 : 539.16.08 *see Abstr.* 1822

519.283 : 612.85 : 534.77 *see Abstr.* 1782

519.3 : 517.933.2 *see Abstr.* 1734

519.4 : 535.338 : 548.0 *see Abstr.* 1883, 1884

522.2 : 522.982.2 1739

A comparison between reflectors and refractors for planetary work. ROSEBRUGH, D. W. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 76–78, *Feb.*, 1944.—The definition obtained with an $8\,^3/_4$ in. mirror is found to be improved by using a $5\,^1/_4$ in. aperture diaphragm in front of the mirror. The effect is attributed partly to covering the outer zones of the mirror, which are distorted by unequal cooling, and partly to discarding light rays passing through striated air close to the cool walls of the telescope tube. Data are given which show that in moments of good seeing the reduced-aperture reflector compares favourably for planetary work with a refractor of similar size. A. HU.

522.614.2 1740

A semi-automatic graphical intensitometer for the reduction of microphotometer tracings. BEALS, C. S. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 65–75, *Feb.*, 1944.—Dimensions and technical details are given for an instrument which, with the aid of a photographic characteristic curve mounted on a movable carriage, converts a microphotometer tracing in which the ordinates are galvanometer deflections (i.e. transmissions) into a record of true intensities. The operator has to keep images of the calibration curve and of a fixed index intersecting the tracing at the same point, and the motion of the carriage in doing this is transmitted to a pen which draws the intensity record. The accuracy of the record is assessed experimentally. The time for obtaining equivalent widths of absorption lines is reduced to $^1/_{10}$ that of the point-by-point method, and a rectified line profile can be obtained in less than $^1/_5$ the time needed by the older method. A. HU.

522.9 : 530.12 : 523.78 *see Abstr.* 1747

522.982.2 : 522.2 *see Abstr.* 1739

523.11 : 539.16 *see Abstr.* 1821

523.2 1741

Origin of the planets. LYTTLETON, R. A. *Nature, Lond.*, 153, *p.* 592, *May* 13, 1944.

523.752 1742

Sunspot prominences—some comparisons between limb and disc appearances. ELLISON, M. A. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 22–32, 1944.—Spectrohelioscope observations are used to compare prominences of types III*a*, III*b* and III*c* as they appear at the limb and on the disc. The discussion refers particularly to the type of associated spot-group, to the form and dimensions of prominence filaments, to the velocity and direction of motion relative to adjacent spots, and to the magnetic polarity of spots at points of inflow. A. HU.

523.752 : 550.385 1743

Solar flares and magnetic storms (second paper). NEWTON, H. W. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 4–12, 1944.—Previous work [Abstr. 41 (1944)] is extended to less intense flares, which show progressively less statistical connection with geomagnetic activity (as shown by storms or increased character figures), until at intensity 2 there is no perceptible association. A sudden drop in effectiveness betw. flares of intensity 3 + and those of intensity 3 is accompanied also by a drop in the fraction of "great" storms amongst those which do occur. Some distinctive flares of intensity 3 are tabulated. Data from radio fade-outs confirm in a general way a statistical rise of geomagnetic activity a few days after the fade-outs, but the results are less definitive than those from the solar observations themselves. A. HU.

523.752 : 550.385 1744

Relation between magnetic storms and solar activity. ALLEN, C. W. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 13–21, 1944.—The effects of individual solar phenomena on geomagnetism are assessed. Magnetic data are grouped according to recurrence tendency, storm intensity and sudden commencements, and are correlated in turn with the occurrence of large sunspot groups, chromospheric eruptions and ionospheric fade-outs. "Great" magnetic storms are found to follow solar flares in $1\frac{1}{2}$ days, smaller storms in $2\frac{1}{2}$ days. Solar M regions associated with recurrent storms give rise to particles which reach the Earth in 3 days. They tend to avoid the area within 40° of sunspots, and are tentatively identified with coronal streamers, which are repelled by coronal plumes focused near sunspots. This hypothesis is not in accord with Waldmeier's [Abstr. 1320 (1943)]. A. HU.

523.755 1745

On the distribution of intensity within the solar corona. BRÜCK, H. A. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 33–37, 1944.—From measurements of a 1905 eclipse plate, isophotes in the inner corona betw. 2′ and 9′ from the limb are drawn for an intensity range of 2·5 magnitudes. The intensity gradients found are smaller along coronal streamers than elsewhere, an effect which confirms Waldmeier's work [Abstr. 1853 (1943)] but which is opposite to that observed in the outer corona. A. HU.

523.77 : 523.87 *see Abstr.* 1748

523.774 1746

Note on the wavelength of the sodium line D_2 in the Sun. EVERSHED, J. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 38–39, 1944.—An error of + 0·006 Å in this wavelength is attributed to blending with a faint telluric line. Measurements of the exact position can be made only at the W. limb, where the rotational shift covers the telluric line. The observed difference of wavelength betw. D_1 and D_2 agrees with the laboratory value, and the red shifts of both, as compared with the vacuum arc, agree closely with the relativity value. A. HU.

523.78 : 530.12 : 522.9 1747

The problem of an accurate determination of the relativistic light deflection. FREUNDLICH, E. F., AND LEDERMANN, W. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 40–47, 1944.—The theory of the observational errors in measuring the gravitational light deflection is discussed with a view to designing future eclipse expedition programmes. The weight of the determination is small unless a large number of stars, symmetrically disposed close to the Sun, are observed. Min. exposure times and apertures are deduced. The scale correction must be determined separately by a method which does not involve swinging the camera from its eclipse position, otherwise small changes of focus will vitiate the scale factor. A. HU.

523.87 : 523.77 1748

Metals in the stars. JONES, H. SPENCER. *J. Inst. Met.*, 70, *pp.* 175–196, *May*, 1944.—An account is given of spectrographic methods which permit the identification of metals present in the stars. The elements present in the Sun are discussed; only the elements in the outer layers of the Sun and stars can be determined. The abundance of metals in the Sun, the Earth, and meteorites is about the same; in the case of non-metals, some striking differences occur, from which conclusions are drawn about the evolution of the Earth's atmosphere. The spectrum of the Sun's corona is due to atoms of Fe, Ni and Ca in states of high ionization. Interstellar space contains an extremely tenuous gas, in which atoms of Ca, Na, Ti and Fe have been detected. The ultimate lines of ionized Ca are the only lines that can be detected in the spectra of the faint remote galaxies and provide the basis for the most reliable method of estimating the distances of these galaxies.

525.75 1749

Night illumination and energy distribution in the spectrum of the night sky. PHEOFILOV, P. P. *C.R. (Doklady) Acad. Sci. URSS*, 34, 8, *pp.* 228–232, 1942.—A preliminary account covering the main results of observations made during Oct.–Nov., 1941, in the vicinity of Joshkar-ola (lat. 56° 40′ N., long. 47° 55′ E.). The influence of artificial light was precluded. A comparison was made by photometer, of the brightness in a horizontal white screen with that of the self-luminosity of uranyl potassium sulphate crystals. Curves show the illumination during the night for various conditions of the night sky. Measurements of the mean spectral composition of the night illumination were made from 4 000 to 6 500 Å, using the integrating photographic method. The average of a number of curves of energy distribution is discussed. A. E. T.

526.918.742 1750

The Stereograph. FIELD, R. H. *Canad. J. Res. F*, 22, *pp.* 62–72, *May*, 1944.—A compound stereo-

scope is described having facilities for (*a*) measuring parallax displacements and correspondence errors on vertical stereo air photographs, (*b*) measuring the rectangular co-ordinates of images on air photographs, (*c*) plotting air bases and minor control in strips of air photographs, (*d*) plotting, to a predetermined scale, planimetric detail in untilted or rectified vertical air photographs, (*e*) plotting form lines by the floating-mark method.

530.1 1751

The evaluation of the cosmical number. EDDINGTON, A. S. *Proc. Camb. Phil. Soc.*, 40, *pp.* 37–56, *March*, 1944.—The cosmical number, $N = {}^3/_2 \cdot 136 \cdot 2^{256}$ which is of significance as a fundamental const., is determined directly from the principles of measurement. It is shown "not that there are N particles in the universe, but that anyone who accepts certain elementary principles of measurement must, if he is consistent, think there are." The representation of conceptions by symbolic algebra plays a dominant part in the discussion. The first four sections are concerned with the theory of measurables. The connection with the main body of Physics is indicated in the next section, and a considerable part of the remaining sections is devoted to an account of the properties and use of the E- and EF-frames (wave tensor calculus). The paper completes the author's determination of all the fundamental physical constants [Abstr. 352 (1944)].

L. S. G.

530.12 : 522.9 : 523.78 *see Abstr.* 1747

530.12 : 537.122 = 4 1752

New type of electron. PROCA, A. *Portugaliae Physica*, 1, 2, *pp.* 59–65, 1944.—It is pointed out that relativity suggests the existence of a particle different from the Dirac electron, though it has the same mass and charge and, in a given direction, the same spin. Although it has a const. charge and mechanical moment, its energy varies. A. J. M.

530.15 1753

Newton's third law of motion. MOTT-SMITH, M. *Amer. J. Phys.*, 12, *p.* 109, *April*, 1944.—[See Abstr. 820 (1944)].

531.25 1754

A note on a new form of the three-moment equation. MORRISON, I. F. *Engng J. Can.*, 27, *pp.* 143–145, *March*, 1944.—Clapeyron's 3-moment equation is derived in a simple form by the use of moment surfaces (obtained by plotting the b.m. curve for each member of a framed structure). An example of its use is given. L. S. G.

531.55 1755

Three demonstration experiments on projectile motion. SUTTON, R. M. *Amer. J. Phys.*, 12, *pp.* 104–105, *April*, 1944.

531.719.1 1756

Radius-of-curvature measurements. SCHEPLER, H. C. *Amer. J. Phys.*, 12, *pp.* 107–108, *April*, 1944.

531.756.4 : 532.14 *see Abstr.* 1761

531.787.9 : 537.54 *see Abstr.* 1814

532.13 : 547.458.8 1757

Cupriethylene diamine as a solvent for precise determination of cellulose viscosity. HATCH, R. S. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 104–107, *Feb.* 17, 1944.

532.13 : 576.311 : 591.175.4 1758

Viscosity and contraction of unstriated muscle. SINGH, I. *Nature, Lond.*, 153, *pp.* 591–592, *May* 13, 1944.

532.133 1759

Mixture law for viscosity. KOTTLER, F. *J. Phys. Chem.*, 48, *pp.* 76–80, *March*, 1944.—A mathematical derivation of laws previously stated [Abstr. 2301 (1943)] for ideal and non-ideal liquids. N. M. B.

532.133 : 532.712 : 539.133 : 547.458.6 1760

Relationship between solution viscosity and molecular weight in the amylose series. FOSTER, J. F., AND HIXON, R. M. *J. Amer. Chem. Soc.*, 66, *pp.* 557–560, *April*, 1944.—Osmotic-pressure values for corn and tapioca amylose are given and mol. wts. of other members of this series estimated from other considerations. A dependence of intrinsic viscosity on a power of mol. wt. > 1 is indicated, confirming expectations from the comparative rigidity of Fischer–Hirschfelder models of amylose. The rigidity of acetylated amylose molecules in chloroform appears to be the same as that of amylose in ethylenediamine.

532.14 : 531.756.4 1761

Densities of liquids and their temperature changes. ANTONOFF, G. *J. Phys. Chem.*, 48, *pp.* 80–85, *March*, 1944.—High-precision density/temp. data are reported and plotted for super-dried and purified propyl alcohol. Discrepancies in duplicate experiments are attributed, not to experimental error, but to the impossibility of complete reproducibility. In the case of propyl alcohol the only possibilities are tautomerism within the mol. or that the mols. react with one another. Kinks in the curve are attributed to a change in the degree of polymerization with the change of temp. N. M. B.

532.517 1762

On the shearing motion of a fluid past a projection. DEAN, W. R. *Proc. Camb. Phil. Soc.*, 40, *pp.* 19–36, *March*, 1944.—[See Abstr. 2324 (1940)]. The problem is the study of the 2-dimensional motion of an incompressible viscous liquid past a projection. The form assumed for the boundary is such that the area in the Z-plane can be mapped conformally on a circle in the ζ-plane by a rational function of ζ, which contains a parameter a ($0 < a \leqslant 1$). By varying a we vary the shape of the projection. The equation for the stream function is solved by a method due to Muschelišvili [Abstr. 4753 (1933)]. If $a = 1$ there is in the motion a closed vortex on the downstream side of the projection. If a is just < 1 there is a closed vortex only if a certain critical velocity V_c is exceeded. $V_c \to 0$ as $a \to 1$. L. S. G.

532.517 : 517.544 1763

On the design of water flowing under structures in strata of different permeability. KOZLOV, V. S. *C.R.* (*Doklady*) *Acad. Sci. URSS*, 32, 8, *pp.* 536–539, 1941.—The paper deals with the plane motion of ground waters under hydraulic constructions in a foundation which is assumed to consist of 2 layers. Two cases are discussed, according as the lower layer is limited or unlimited in depth. The velocity potentials in the two layers are found by means of a con-

formal mapping, and the problem involves the solution of an integral equation. L. S. G.

532.525 : 518.61 *see Abstr.* 1737

532.582.7 1764

Silt transportation and its relation to régime channel sections. GRIFFITH, W. M. *J. Instn Civ. Engrs*, 22, *pp.* 107–120, *April*, 1944.—Various formulae relating to silt transportation in channels of different sectional dimensions and slopes, derivable by considerations based upon the expression for the mean velocity in a vertical section of the stream in terms of the silt concentration at any depth, are obtained and discussed [*Trans. Amer. Soc. Civ. Engrs*, 104, p. 1734, 1939]. Tables giving dimensions of trapezoidal channel sections discharging 20, 100 and 1 000 ft.^{3} of silt per sec., with slopes ranging from 1/80 000 to 1/4 000, and sectional dimensions yielding max. values of discharges of bed sand, are given. Lacey's empirical equation for the rel. betw. velocity, depth and silt charge for régime sections is invalid. An empirical equation, also due to Lacey, gives agreement with the author's theoretical values for hydraulic mean depth. Three necessary conditions to secure régime sections for irrigation canals are suggested. J. S. G. T.

532.582.7 1765

Calculation of the critical shear stresses and the sediment sizes. QURAISHY, M. S. *Curr. Sci.*, 12, *pp.* 333–334, *Dec.*, 1943.—[See Abstr. 834 (1944)]. A method is discussed for avoiding the process of successive approximations in deducing values of particle size in the problem of the transport of sediment by a stream. J. S. G. T.

532.582.7 1766

Critical discharge of streams in uniform flow. QURAISHY, M. S. *Curr. Sci.*, 13, *pp.* 83–84, *March*, 1944.—[See Abstr. 1765 (1944)]. Discusses the critical discharge method of correlating particle characteristics with the hydraulic elements of streams when sediment particles, initially at rest on the stream bed, are ejected and propelled forward. Calculated results agree with observational results. J. S. G. T.

532.612 : 532.77 1767

An approximate relation between surface tension and concentration for regular solutions. WALES, M. *J. Chem. Phys.*, 12, *pp.* 135–142, *April*, 1944.—Using Hildebrand's model and calculating the work per unit interfacial area required to separate a body of liquid reversibly into two infinitely removed parts, it is shown that $\gamma = v_1^2\gamma_1 + v_2^2\gamma_2 + cv_1v_2$, where γ is the surface tension of a solution consisting of two liquids of surface tensions γ_1 and γ_2 and v_1 and v_2 are the fractions (by volume), assuming there is no change in volume upon mixing. Here c is a const. and in general $c \leqslant 2\sqrt{\gamma_1\gamma_2}$. The linearity of surface tension with volume fraction in ideal systems is predicted, in agreement with experiment. There is a comparison of calculated and experimental results in the case of several organic solutions. L. S. G.

532.685 : 551.579.5 1768

The effect of concentration of sodium carbonate in aqueous solutions on (a) the formation of cracks, (b) swelling and dispersion, and (c) capillary ascent in the black cotton soil. RAMDAS, L. A., AND MALLIK, A. K. *Curr. Sci.*, 13, *pp.* 42–44, *Feb.*, 1944.—[See Abstr. 80 (1944)]. For a const. quantity of black cotton soil there is an optimum conc. of Na_2CO_3 at which its auto-dispersion is most effective. Capillary ascent of Na_2CO_3 solutions through black cotton soil decreases rapidly as the conc. of Na_2CO_3 increases from 0·03% to 2%; as the conc. of the solute increases further, the permeability of the soil is rapidly restored. When 100 g. of soil are mixed with 60 cm.^{3} of Na_2CO_3 solution of various conc. and the pastes dried in a steam oven, the widths of cracks formed increase to a max. at conc. 3%; cracks are formed only in the range of solute 0–5%. J. S. G. T.

532.696.1 1769

Prevention of capillary disturbances in electrolytic field plotting troughs and in McLeod gauges. KLEMPERER, O. *J. Sci. Instrum.*, 21, *p.* 88, *May*, 1944.—Slight grinding, providing a number of microscopic capillary grooves ⊥ the glass/liquid contact line (by moving a wet rag, covered with finest emery compound, a few times ⊥ the line) facilitates complete wetting.

532.71 : 542.64 1770

A dialysis cell for rapid quantitative analytical determination of diffusible components in blood plasma. HAMILTON, P. B., AND ARCHIBALD, R. M. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 136–137, *Feb.* 17, 1944.

532.712 1771

Osmotic pressures for mixed solvents. WALL, F. T. *J. Amer. Chem. Soc.*, 66, *pp.* 446–449, *March*, 1944.—The problem of osmotic pressures for solutions with mixed solvents is considered thermodynamically. The measured o.p. has definite significance only if the solvent compositions are different on the 2 sides of the membrane and subject to certain relationships. Van't Hoff's equation can be expected to hold for infinitely dilute solutions. For conc. solutions certain complications can be expected in the experimental determination of o.p. using mixed solvents, especially if a dynamic approach is employed.

532.712 : 539.133 : 547.458.6 : 532.133 *see Abstr.* 1760

532.712.08 1772

The osmotic balance. JULLANDER, I., AND SVEDBERG, T. *Nature, Lond.*, 153, *pp.* 523–524, *April* 29, 1944.—For measurements of lower osmotic pressures than can be made by capillary-tube methods, the osmometer described, adapted from an analytical balance, allows the liquid passing through the membrane to be weighed. Illustrative data indicate a high degree of accuracy. N. M. B.

532.733 1773

Furfural solution temperatures of hydrocarbons. RICE, H. T., AND LIEBER, E. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 107–110, *Feb.* 17, 1944.—The application of furfural for the determination of miscibility solution temperatures of petroleum fractions and the influence of the composition of the 60° diluent on the results of the mixed aniline-point test were studied. Furfural is non-toxic and is directly applicable to petroleum fractions of high aromatic content, making possible elimination of mixed aniline-point determination.

532.739.2 1774

The solubility of aluminium bromide in *n*-butane. HELDMAN, J. D., AND THURMOND, C. D. *J. Amer. Chem. Soc.*, 66, *pp.* 427–431, *March*, 1944.—The solubility was measured from 28·3° to the m.p. 97·5°. There is no evidence for a phase transformation near 70°. The solubility relationships in other solvents are briefly discussed.

532.77 1775

A modification to the cryoscopic equation. BRANCKER, A. V., LEACH, S. J., AND DANIELS, V. A. *Nature, Lond.*, 153, *p.* 407, *April* 1, 1944.

532.77 : 532.612 *see Abstr.* 1767

532.77 : 547.599.6 1776

On the cryoscopic constant of camphor. RICCI, J. E. *J. Amer. Chem. Soc.*, 66, *pp.* 658–659, *April*, 1944.—[See Abstr. 113 (1944)].

533.4 1777

A brief history of the barometer. MIDDLETON, W. E. K. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 41–64, *Feb.*, 1944.—The author describes improvements made during the past 200 yr. in the Torricellian barometer and in methods of reading it, and reviews modern developments in non-mercurial barometers.

A. HU.

533.5 = 3 1778

High-vacuum technique and high-vacuum pumps. JUSTI, E. *ETZ* [*Elektrotechn. Z.*], 64, *pp.* 285–287, *June* 3, 1943.—Gaede's work on the rotary mercury pump, the molecular pump and the diffusion pump is reviewed. Two kinds of diffusion are distinguished, depending on the pressure. Under atm. pressure a vapour current sweeps gas molecules with it and molecules from outside do not diffuse against the direction of flow. Under l.p., diffusion of gas molecules may occur against the flow of vapour. Both kinds of diffusion occur in the high-vacuum diffusion pump. A comparison is made with Langmuir's, Volmer's and Burch's types of pump. R. N.

534.1 + 534.372 1779

Torsional vibration. I–II. WARING-BROWN, R. *Pwr Transm., pp.* 388–392, *May, and pp.* 451–459, *June*, 1944.—Fundamental principles, natural and forced vibration, 2-mass single-point and 3-mass 2-point vibrating systems, are surveyed. The balancing of reciprocating and rotating masses, and critical (whirling) speed, are considered. Elimination of vibrations and damping devices, dynamic, spring-coupling and rubber-metal bonded, are discussed, followed by a comprehensive survey of mechanical friction dampers, illustrated by diagrams. Hydraulic dampers, incl. the throttle and floating-mass types, are considered. M.-V.

534.25 1780

On Rayleigh waves on the confines of two solid elastic media. GOGOLADZE, V. G. *C.R.* (*Doklady*) *Acad. Sci. URSS*, 33, 1, *pp.* 15–17, 1941.—Two semi-infinite elastic solids given by $y > 0$ and $y < 0$ have densities ρ_1, ρ_2 and elastic constants λ_1, μ_1 and λ_2, μ_2 respectively. Displacements in the two regions are given by means of the potentials $u_i = \partial\phi_i/\partial x + \partial\psi_i/\partial y$, $v_i = \partial\phi_i/\partial y - \partial\psi_i/\partial x$, where $i = 1$ for $y > 0$ and $i = 2$ for $y < 0$. The potentials ϕ_1, ψ_1, ϕ_2, ψ_2 satisfy the wave equations. Applying a theory of Soboleff and Smirnov, potentials of a special form are found and these lead to necessary and sufficient conditions for the existence of Rayleigh waves.

L. S. G.

534.372 + 534.1 *see Abstr.* 1779

534.413 1781

Simple sensitive flames. ANDRADE, E. N. DA C. *Nature, Lond.*, 144, *p.* 498, *April* 22, 1944.—[See Abstr. 1882 (1941)].

534.77 : 612.85 : 519.283 1782

Statistical trends among hearing-aid users. STROMMEN, E. *J. Acoust. Soc. Amer.*, 15, *pp.* 211–222, *April*, 1944.—The paper gives an analysis of 10 000 cases of hearing-aid users from information collected during the release of a new vacuum-tube hearing-aid. Among the facts related are the following: males require a h.f. accentuation type of fitting more often than females; more females than males require uniform amplification or l.f. accentuation. Of the two forms of deafness, conductive (middle ear) and nerve (internal ear), bone conduction is more helpful in the former case. Women hear better by bone conduction than men. The fact that some deaf persons hear better in the presence of noise is associated with conductive deafness, but the presence of head noises is not due entirely to any one form of deafness. The greatest number of aid-users attribute their defect to catarrhal trouble; this is followed by 'accidents and occupational causes,' mostly among males, then 'other diseases' and 'hereditary causes.' Deafness attributed to infectious conditions has a higher prevalence among females. G. E. A.

534.85 : 681.84 : 621.317.761 1783

Wow-meter. MINER, C. R. *Gen. Elect. Rev.*, 47, *pp.* 31–34, *April*, 1944.—[Abstr. 1507 B (1944)].

534.862.3 : 778.55 1784

A 200-mil push-pull film recording system. GRIGNON, L. D., AND CORCORAN, J. P. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 127–144, *March*, 1944.—Describes a complete sound-recording unit mounted in a lorry. Western Electric light-valve variable-density recording is used to give a 200 mil push-pull track. The speech circuits are conventional and consist of microphone preamplifiers, mixer, 60 c./s. high-pass filter, limiting main amplifier, 8 800 c./s. low-pass filter and monitor equipment. The amplifiers, which are of push-pull resistance-coupled pentode types using negative feedback, are modifications of std. Western Electric equipment. The recorder uses a 4-ribbon light valve and multi-lens optical system. A photo-electric monitor is energized by part of the light leaving the light-valve. The test apparatus for the adjustment of noise level, gain and level, and for the measurement of harmonic distortion, is included. Schematic circuit diagrams, performance curves and photographs illustrate the details of the apparatus. C. F. B.

535.12 1785

Impact of a wave packet and an absorbing particle. IVES, H. E. *J. Opt. Soc. Amer.*, 34, *pp.* 222–228, *April*, 1944.—[See Abstr. 1911 (1943)]. After impact, the radiation no longer exists as such, but is transformed into heat, which is kinetic energy of the atoms or subparticles of which the absorbing particle is composed. By considering the change of mass of these atoms due to their motion, the overall change

of mass of the absorbing particle can be obtained and the equations of motion derived. The case of the stationary absorbing particle is dealt with, and that of a system in uniform motion, the concluding section being concerned with the pressure of radiation on an absorbing particle. The results obtained show complete invariance of all measurable quantities (absorbed heat, rate of heating, velocity, pressure) with velocity of the system. While the results obtained are self-consistent, the values of the various quantities, in particular of pressure on a moving absorbing target, are at significant variance with the values obtained by other methods of approach. A. W.

535.215 : 537.525.8 1786

Light-effect in chlorine under electrical discharge: influence of the gas pressure. JOSHI, S. S., AND DEO, P. G. *Nature, Lond.*, 153, *pp.* 434–435, *April* 8, 1944.—[See Abstr. 1614 (1943)].

535.243 1787

Colorimetric determination of germanium as molybdigermanic acid. KITSON, R. E., WITH MELLON, M. G. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 128–130, *Feb.* 17, 1944.—A spectrophotometric study of the molybdigermanic acid method for determining Ge shows the procedure works well when the yellow colour is developed in 5 *N* acetic acid solution. Preferably the molybdate solution is added to the acidified germanate solution. For 5 cm. thickness the range is 0 to 30 p.p.m., through which Beer's law applies. Other elements forming coloured heteropoly solutions, such as As and Si, interfere with the determination of Ge by this procedure. Picric acid or buffered $K_2Cr_2O_7$ solutions are suitable for use as permanent standards for visual comparison.

535.247.4 1788

Rapid photometric determination of total nitrogen, phosphorus, and potassium in plant material. WOLF, B. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 121–123, *Feb.* 17, 1944.—The plant material is rapidly ashed by means of H_2SO_4 and H_2O_2. Tests for the 3 elements are run on separate aliquots of the ash extract by means of a photo-electric colorimeter. Comparison with A.O.A.C. methods shows fairly good agreement.

535.247.4 1789

Photo-electric photometry. An analysis of errors at high and at low absorption. HAMILTON, R. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 123–126, *Feb.* 17, 1944.—Mathematical and experimental proofs show that errors in setting the zero point and I_0 on the galvanometer, and in reading the galvanometer deflection for transmitted light, produce high rel. errors when a photo-electric photometer is used with solutions of high or of low absorption. For max. accuracy, conditions should be so chosen that readings of transmitted illumination fall on the central portion of the scale. E. R. A.

535.313.1 1790

The Schmidt–Cassegrain systems and their application to astronomical photography. LINFOOT, E. H. *Mon. Not. Roy. Astr. Soc.*, 104, 1, *pp.* 48–64, 1944.—The method of plate-diagram analysis [Abstr. 2846 (1942)] is applied to a general survey of Schmidt cameras arranged in Cassegrain form. Explicit formulae are obtained for the figuring strengths of the general Baker cameras [Abstr. 2047 (1940)] in terms of the component spacings. Monocentric Schmidt–Cassegrains and flat-fielded aplanats with both mirrors spherical are discussed as special cases, and their distortion is considered. A. HU.

535.33 : 537.531 = 4 *see Abstr.* 1811

535.33 : 545.82 1791

The spectrographic determination of small amounts of impurities in magnesium chloride. WILSON, M. F. *J. Opt. Soc. Amer.*, 34, *pp.* 229–233, *April*, 1944.—Analytical curves are worked out for B, Si, Mn, Fe, Al, Cu, NaCl and $CaCl_2$. Samples of $MgCl_2$ varying from very dilute solutions to solids may be analysed on these curves with high degree of accuracy.

535.338 : 519.4 : 548.0 *see Abstr.* 1883, 1884

535.338 : 548.0 *see Abstr.* 1877–1882

535.338.4 : 541.124.7 1792

Discussion on band spectra and energies of dissociation of diatomic molecules. *Proc. Phys. Soc., Lond.*, 56, *pp.* 204–212, *May*, 1944.

535.338.4 : 546.172.6 1793

The spectrum of NO: rotational analysis of epsilon bands and new observations on the beta and delta band-systems. GAYDON, A. G. *Proc. Phys. Soc., Lond.*, 56, *pp.* 160–174, *May*, 1944.—A rotational analysis was made for the (0,4) and (0,3) bands of the ε system of NO. From consideration of the defect (due to Λ doubling) between P, Q and R combinations, the initial electronic state is of type $^2\Sigma+$. Potential-energy curves for the known electronic states of NO are shown. Observations were made on the excitation of the β and δ systems of NO in the N_2 afterglow. Bands of the β system with $v' = 5$ and 6 were obtained in emission. The energy of dissociation of NO and supposed predissociations in the spectrum are discussed. Flory and Johnston's interpretation of the photodissociation of NO by Hg 1 832 Å appears to be incompatible with present observations.

535.34 : 548.73 : 537.531 *see Abstr.* 1812

535.343-31 : 547.63 1794

Quinoidation of triaryl compounds—hydroxyphenylbiphenylcarbinols. ANDERSON, L. C., AND FISHER, W. A. *J. Amer. Chem. Soc.*, 66, *pp.* 589–593, *April*, 1944.—4-hydroxy-4′-phenyltriphenylcarbinol and 4-hydroxy-4′, 4″-diphenyltriphenylcarbinol were made. Each carbinol was isolated in the benzenoid and quinonoid forms and various derivatives are described. The ultra-violet absorption spectra of these carbinols and certain derivatives were determined. The *p*-biphenyl group acts as an isolated unit in absorption, producing a characteristic, high, broad absorption band near 3 800 mm.$^{-1}$ which resembles the band others have reported for biphenyl itself. A study of the ultra-violet absorption for the fuchsones of the carbinols indicates that resonance structures appear to be an important factor in the absorption of ether solutions of fuchsones.

535.343-31 : 547.63 1795

Quinoidation of triaryl compounds—hydroxybiphenyldiarylmethyl cations. ANDERSON, L. C., AND FISHER, W. A. *J. Amer. Chem. Soc.*, 66, *pp.* 594–597, *April*, 1944.—4-(*p*-hydroxyphenyl)-triphenylcarbinol and the corresp. methoxy compound were

made, as well as the related compounds secured by replacing 1 and then both phenyl groups by *p*-biphenyl groups. A comparison of the visible absorption of the 4-phenyltriphenylmethyl, 4-methoxy-4′-phenyltriphenylmethyl and 4-(*p*-anisyl)-triphenylmethyl ions and the corresp. ions containing an additional 4-phenyl substituent indicates that the biphenyl group is quinonoid in the 4-(*p*-anisyl) compounds. Replacing an hydroxyl group by a methoxy group causes a shift in the absorption max. of the principal band, which is different in direction depending on whether the substituted group is on a phenyl or biphenyl group.

535.343.4 1796

Some effects of solvents upon the absorption spectra of dyes. III. Temperature and organic solutions of cyanine dyes. SHEPPARD, S. E., AND BRIGHAM, H. R. *J. Amer. Chem. Soc.*, 66, *pp.* 380–384, *March*, 1944.—[See Abstr. 1410 (1943)]. Effects of change of temperature on the absorption spectra of cyanine dyes in organic solvents were measured from 300° to 90°K. The dyes showed no displacement of the wavelengths of max. absorption. The spectra became appreciably sharper as the temperature fell, which is attributed to suppression of rotational and low-order vibrational energies. The sharpening produced at first an increase in ε_{max} (or log ε_{max}) but as the temperature was further lowered, a reduction in band strength occurred—less or absent in the case of non-planar dyes. Non-ionized merocyanine dyes show a greater or less displacement of the spectrum with change of temperature, depending upon the polarity of the solvent. A sharp coupling of solvent and soluble (dye) molecules is indicated by this displacement.

535.371 1797

A theory of concentrational depolarization of fluorescence in solution. WAWILOW, S. I., AND PHEOFILOV, P. P. *C.R. (Doklady) Acad. Sci. URSS*, 34, 8, *pp.* 220–223, 1942.—The phenomenon of reduction of polarization of fluorescence with increase of concentration of the solute was treated quantitatively by Pheofilov and Sveshnikov [*J. Phys. USSR*, 3, 498, 1940], an empirical relationship being established. The concept of the transfer of excitation energy is applied in a general manner, without special hypotheses, and an explanation of the empirical formula obtained. A. E. T.

535.372 : 548.0 *see Abstr.* 1885

535.375.5 : 548.0 *see Abstr.* 1886

535.415 : 535.514.2 1798

New contributions to interferometry. III. The differential polarization phase change on reflection at a thin silver film. IV. The ghost images and scatter rings of the Fabry–Perot interferometer and their effects in hyperfine structure observations. TOLANSKY, S. *Phil. Mag.*, 35, *pp.* 179–187, *March, and pp.* 229–241, *April*, 1944.—The differential phase change at reflection, for (green Hg) light polarized in and $\perp$ the incident plane, is determined for a silver film $0{\cdot}1\lambda$ thick. The effect is measured by a multiple-beam Newton's ring apparatus [Abstr. 1091 (1944)] over an incidence range of 0° to 80°. The experimental results agree with classical theory. Up to an incidence of 60°, the experimental curve of the variation with incidence is $\parallel$ the theoretical curve but slightly displaced upwards (by $0{\cdot}007\lambda$). There exists a point of inflection at 63°, not predicted by theory. The intensity ratios of the two beams are visually estimated for different incidences. The beam polarized with the magnetic vector $\parallel$ the incident plane is rapidly absorbed as the angle of incidence increases. The absorption curve exhibits a point of inflection. The influence of the fringe-doubling arising from the differential phase change with the Fabry–Perot interferometer, when used for high-resolution spectroscopy, is considered. The doubling leads to a reduction in resolution even before doubling can be directly detected. The origin of the ghost images due to the reflections at the unsilvered faces of a Fabry–Perot interferometer is discussed. The effects of these images upon hyperfine structure investigations is considered. The way in which the particular type of crossing with a spectrograph influences the behaviour and effects of the ghost images, is examined. The effects of scattered light from the intense beam back-reflected from the first silvered surface are considered.

535.415 = 3 1799

On the passage of totally reflected light in a thin medium. GOOS, F., AND HÄNCHEN, H. *Ann. Phys., Lpz.*, 43, 5, *pp.* 383–392, *Oct.*, 1943.—A rt.-angle prism P_1 with plane hypotenuse touches a second rt.-angle prism P_2 having as hypotenuse a spherical cap of large radius of curvature (6·35 m.). Light from an Na flame ($\lambda = 589{\cdot}3\,\mu\mu$), after passing through a collimator, penetrates P_1 and enters the thin air layer between P_1 and P_2 where Newton's rings are produced. The intensity distribution of these is measured by a photographic method, and this permits the calculation of the thickness of the air layer, which varies from zero to 0·01 mm. and is found with an accuracy of about $\lambda/30$. If total reflection takes place at the plane hypotenuse the rings vanish and only a central spot remains. The intensity distribution in this spot is measured by a photographic method and represented as a function of the thickness of the air layer. A mathematical treatment is given, interpreting the spot as an interference phenomenon. L. S. G.

535.417 : 539.211 : 549.12 1800

The microtopography of diamond and sapphire surfaces. KAYSER, J. F. *Industr. Diamond Rev.*, 4, *pp.* 72–75, *April*, 1944.—The surface imperfections of hard gems are so diminutive that the interference method of observation is probably the only satisfactory one, though cleavage surfaces may be photographed under vertical illumination. A diamond wedge, about 3 mm. square and $^1/_2$ mm. thick, with an angle of about 1°, is found very suitable for investigating both sawn and polished surfaces. When used with a Vickers projection microscope it affords a ready means of obtaining interferograms from which the depth of the surface markings may easily be determined. Interferograms given for a number of diamond and sapphire surfaces show that in general such surfaces are particularly free from scratches and remarkably flat right up to the edges of the facets. (See Abstr. 934 (1944)]. A. W.

535.434 1801

Some light-scattering experiments with high-polymer solutions. DOTY, P. M., ZIMM, B. H., AND MARK, H.

J. Chem. Phys., 12, *pp.* 144–145, *April, and pp.* 203–204, *May*, 1944.

535.434 : 578.083 1802

Microbiological aspects of penicillin. II. Turbidimetric studies on penicillin inhibition. FOSTER, J. W., AND WILKER, B. L. *J. Bact.*, 46, *pp.* 377–389, *Oct.*, 1943.—This paper mainly deals with the various applications of turbidimetry to the study of *in vitro* penicillin effects. Data on the procedure are given.

C. J. G.

535.514.2 : 535.415 *see Abstr.* 1798

535.663 : 667.2 : 518.3 1803

A nomogram to help in the dyeing of fine and coarse filament rayons and spun rayons to the same shade. FOTHERGILL, F. *J. Soc. Dy. Col., Bradford*, 60, *pp.* 93–95, *April*, 1944.—The use of the nomogram enables the dyer to find out in a few sec. how much more dye is required for a finer-filament yarn to match it against a coarser-filament yarn already dyed; or how much less dye will be required to make a coarser-filament yarn match one with finer filaments. The formula required is worked out, and the nomogram is this formula in diagrammatic form. The use of the nomogram is described, and the accuracy of the results obtained with it is discussed. It has been found in practice that dissimilarity in shape of cross-section is not normally great enough to upset the match when the amounts of dye in the two yarns are accurately in the ratio demanded by the formula, which is $c_2/c_1 = \sqrt{D_1}/\sqrt{D_2}$ where c_1 and c_2 are the conc. of dye in the two yarns and D_1 and D_2 are the respective filament deniers of the two rayons.

H. H. HO.

535.7 = 4 1804

Nocturnal myopia and presbyopia. PALACIOS, J. *Portugaliae Physica*, 1, 2, *pp.* 47–58, 1944.—Discusses the theories which have been put forward to account for the fact that the eyes exhibit, at very feeble brightnesses, a short-sightedness amounting normally to about 2 dioptres as compared with day vision. The author concludes that in addition to this change in the myopic direction there is also a restriction in the range of accommodation (a presbyopic effect).

J. W. T. W.

535.82 : 669.71 1805

The metallographic examination of aluminium-rich alloys. MASON, N. H., METCALFE, G. J., AND MOTT, B. W. *J. Inst. Met.*, 70, *pp.* 197–213, *May*, 1944.—Describes the procedure adopted at R.A. Establishment. Type of microscope, method of illumination of the specimen, and methods of mounting and polishing specimens of alloys of different types, are dealt with. Some microstructural characteristics of cast and wrought commercial alloys are described, with ref. to defects that have arisen.

536.2.02 1806

Note on a problem in radial flow. JAEGER, J. C. *Proc. Phys. Soc., Lond.*, 56, *pp.* 197–203, *May*, 1944.—The problem of conduction of heat in a circular cylinder with const. flow at the surface is solved by the Laplace transformation method. A previous solution [Abstr. 1664 (1943)] is shown not to be exact, but a good approximation, and its region of usefulness is compared with that of the other types of solution. The idea can be extended to other boundary conditions, const. temperature, or radiation, the result being that with any of these boundary conditions, and const. initial temperature, corresponding times, t_1 for a slab, t for a cylinder, can be found, such that the temperature distribution in the slab at time t_1 is a good approximation to that in the cylinder at time t. Numerical values of t_1 as a function of t are given.

536.423.15 : 536.655 : 546.45 1807

The vapour pressure of beryllium at 1 170°–1 340°K. SCHUMAN, R., AND GARRETT, A. B. *J. Amer. Chem. Soc.*, 66, *pp.* 442–444, *March*, 1944.—The v.p. were determined by the Langmuir method. A plot of $\log P$ *v.* $1/T$ is given. Values of ΔH_0^0 were calculated and found to vary with temperature, the mean value being (122 000 ± 2 500) cal./mole. The heat of vaporization was calculated, being 78 800 cal./mole at 1 250°K.

536.532 1808

Method of sealing electrodes into a steam chamber. MUNDAY, S. *J. Sci. Instrum.*, 21, *p.* 67, *April*, 1944.

536.63/.65 : 547.457 1809

The heat of acetylation of α- and β-D-glucose from the heats of combustion of the penta-acetates. CLARKE, T. H., AND STEGEMAN, G. *J. Amer. Chem. Soc.*, 66, *pp.* 457–459, *March*, 1944.—Values for the heats of combustion at 25° and 1 atm. pressure are given for α- and β-D-glucose penta-acetate. The value for the sp. ht. at 25° is also reported. From these and other data, the heats of formation and heats of acetylation were computed.

536.655 : 546.45 : 536.423.15 *see Abstr.* 1807

536.658 : 541.183.022 : 539.133 *see Abstr.* 1810

537.122 : 530.12 = 4 *see Abstr.* 1752

537.525 : 621.314.65 = 3 1810

Plasma phenomena set up by sudden pulses. SCHUMANN, W. O. *Ann. Phys., Lpz.*, 43, 5, *pp.* 369–382, *Oct.*, 1943.—[Abstr. 1479 B (1944)].

537.525.8 : 535.215 *see Abstr.* 1786

537.531 : 535.33 = 4 1811

***L* X-ray spectrum of radium D.** VALADARES, M. *Portugaliae Physica*, 1, 2, *pp.* 73–75, 1944.—Apparatus for the investigation of the X-ray spectrum of Ra D is described. The *L*-spectrum can be obtained if 0·04 g. of Ra is available.

A. J. M.

537.531 : 535.34 : 548.73 1812

The influence of crystal size on the absorption factor as applied to Debye–Scherrer diffraction patterns. TAYLOR, A. *Phil. Mag.*, 35, *pp.* 215–228, *April*, 1944.—The absorption factor derived by the methods of Claassen and Bradley for a cylindrical crystal is applied to the case of a spherical crystal, for which a set of absorption-factor tables is constructed. The absorption factor A for a cyl. powder specimen consists of 2 parts, a micro-absorption factor τ corresp. to the individual reflecting crystallites which are assumed to be spherical, and α, the macro-absorption factor for the specimen as a whole. The effects of crystallite aggregation, size and dilution upon A are discussed. Each constituent in a mechanical mixture must be given its own absorption factor on account of the different values of the micro-absorption factors which can only be neglected when the dimensions of the crystallites fall below 10^{-5} cm. The influence of

the micro-absorption factor on the evaluation of the amplitude of atomic vibration is briefly discussed.

537.531.9 : 591.17 1813

Immediate effect of X-rays on the movements of larvae and pupae of mosquitoes. GOLDHABER, G., AND FELDMAN-MUHSAM, B. *Nature, Lond.*, 153, *p.* 528, *April* 29, 1944.

537.533.73 : 547.29 : 541.6 *see Abstr.* 1869

537.54 : 531.787.9 1814

The discharge tube as a pressure gauge. YARWOOD, J. *Electronic Engng*, 16, *pp.* 461–466, *April*, 1944.—The appearance of a discharge glow at various gas pressures is used as a means of indicating the state of vacuum.

537.562 = 3 1815

Unipolar ionized gas-flow and a new method for determining the dimensions of ions. JOYET, G. *Helv. Phys. Acta*, 17, 2, *pp.* 147–158, 1944.—When a unipolar ionized gas flows through a discharge tube the loss of ions is a function of their diffusion through the neutral gas by which they are carried, and also of their magnitude. By means of the kinetic theory, the connection between the dimensions of ions and the exponential decay of the charge in the gas stream is deduced. An apparatus is described by which a const. unipolar stream can be obtained, and an improved method of obtaining ion densities is worked out. Light ions in air consist of 2–3 mols. A. J. M.

537.564 : 539.185.9 *see Abstr.* 1828

537.591.3 1816

Absorption in the atmosphere and decay of cosmic rays. DUPERIER, A. *Nature, Lond.*, 153, *pp.* 529–530, *April* 29, 1944.

538.22 1817

Further investigations of the magnetic properties of non-homogeneous systems. BATES, L. F., AND SOMEKH, E. M. *Proc. Phys. Soc., Lond.*, 56, *pp.* 182–194, *May*, 1944.—By making use of cylindrical pole surfaces contoured so that $r^{3/2} \cos 3\theta/2 = \text{const.}$, measurements of magnetic susceptibility can be made for non-homogeneous specimens without reference to their distribution in the specimen carrier. The method will be particularly useful in the examination of weakly magnetic crystals. Results are presented for dilute amalgams of some pure metals with Hg, curves being given, showing the variation of susceptibility with conc. at a const. temperature. The data now available for dilute amalgams, obtained by Bates and others, are collected in a single table. All the metals investigated up to now exhibit paramagnetism, when in dilute solution in Hg, to an extent which is usually compatible with an increase in the number of free electrons in the amalgam. The very high value obtained for the susceptibility of Mn, as compared with the values for other metals, indicates that in the case of Mn amalgams practically every particle of Mn must exist as a magnetic carrier. A. W.

539.132 : 546.17 1818

Dissociation energy of nitrogen. GAYDON, A. G. *Nature, Lond.*, 153, *pp.* 407–408, *April* 1, 1944.

539.133 : 536.658 : 541.183.022 1819

Cross-sectional areas of molecules adsorbed on solid surfaces. LIVINGSTON, H. K. *J. Amer. Chem. Soc.*, 66, *pp.* 569–573, *April*, 1944.—For 4 finely divided solids, adsorption isotherms have been measured by the Brunauer–Emmett low-temp. N_2 adsorption technique and by the McBain–Bakr method, using vapours from substances which boil above room temp. By comparison of the isotherms, the cross-sectional area values for the adsorbed molecules (in $Å^2$ per mol.) are: H_2O, 10·6; PrOH, 20·0; heptane, 55·0, if N_2 is taken to be 15·4. These areas agree with the mol. areas determined from density, X-ray, or film-balance measurements.

539.133 : 547.458.6 : 532.712 : 532.133 *see Abstr.* 1760

539.152.1 1820

Survey of nuclear field theories. FLINT, H. T. *Proc. Phys. Soc., Lond.*, 56, *pp.* 149–160, *May*, 1944.—A review in which the work leading up to Yukawa's theory is dealt with. The work of Fermi on the energy distribution of β-rays, and the introduction of the neutrino, is discussed. The nature of the nucleus, and difficulties involved in Fermi's theory of β-disintegration, are considered. The interaction between the neutron and proton, by which the proton becomes a neutron and the neutron a proton, is discussed. The work of Yukawa leading to the suggestion that the interaction between neutron and proton results in the emission of a meson is reviewed, and it is shown that the magnetic moment of the meson agrees with experiment. A. J. M.

539.155.2 : 539.172.4 = 4 *see Abstr.* 1826

539.16 : 523.11 1821

Radioactivity and the origin of life in Milne's cosmology. HALDANE, J. B. S. *Nature, Lond.*, 153, *p.* 555, *May* 6, 1944.

539.16.08 : 519.283 1822

Rate of *n*-fold accidental coincidences. SCHRÖDINGER, E., JÁNOSSY, L. *Nature, Lond.*, 153, *pp.* 592–593, *May* 13, 1944.

539.162 1823

Absorption and coincidence experiments with ^{198}Au. FEATHER, N., AND DAINTY, J. *Proc. Camb. Phil. Soc.*, 40, *pp.* 57–71, *March*, 1944.—An experimental study of the radiation from ^{198}Au (half-value 2·76 ± 0·02 day). The results obtained by other investigators [Abstr. 3975 (1934), 416 (1943)] are for the most part confirmed but the 70 ekV radiation is not simply the *K*-radiation of Hg; the addition is not the *K*-radiation of Pt but a fairly intense γ-radiation of about 65 ekV energy correlated with the primary β-particles of the continuous spectrum. Concerning the latter the measurements of Krishnan [Abstr. 1074 (1941)] are confirmed; the presence of fluorescent *L*-radiation is also demonstrated. Disintegration of ^{198}Au by *K*-electron capture cannot occur, if at all, in more than about 15% of all disintegrations. L. S. G.

539.162 : 550.93 *see Abstr.* 1899

539.163.2 = 4 1824

Spectrography of γ-rays emitted by the active deposit in the slow evolution of radon. SALGUEIRO, L. *Portugaliae Physica*, 1, 2, *pp.* 67–71, 1944.—The γ-radiation emitted in the transmutation Ra D → Ra E has been investigated by absorption, magnetic spectrography and crystal diffraction, and the results are compared. The spectrograph method has been more fully investigated, and the existence of γ-rays of λ267 X.U. has been detected. The rays of λ285–

295 X.U. identified by Rasetti and Amaldi could not be detected after 240 hr. exposure. A new ray of λ396 X.U. was obtained. A. J. M.

539.172.4 = 3 1825

Nuclear reactions of chlorine with neutrons. GIBERT, A., ROGGEN, F., AND ROSSEL, J. *Helv. Phys. Acta*, 17, 2, *pp.* 97–126, 1944.—(n, p) and (n, α) reactions of Cl have been investigated. Rapid neutrons give rise to a large number of groups of protons and α-particles, which are difficult to identify. The energy of the (n, p) and (n, α) reactions is less than 1·16 eMV, so that the mass of Cl^{35} must be less than 34·98053. The process Cl^{35} $(n, p)S^{35}$ is the only one of the series which proceeds to any marked extent with slow neutrons. The energy is $0{\cdot}52 \pm 0{\cdot}04$ eMV, and its effective cross-section is 0·25 of that of the reaction $N^{14}(n, p)C^{14}$. The mean ionization work of Cl_2 is $23{\cdot}5 \pm 1{\cdot}2$ eV per ion-pair. [See Abstr. 1826 (1944)]. A. J. M.

539.172.4 : 539.155.2 = 4 1826

Masses of Cl^{35} and Cl^{37}. GIBERT, A., ROGGEN, F. AND ROSSEL, J. *Portugaliae Physica*, 1, 2, *pp.* 43–46, 1944.—The products of interaction of neutrons with Cl^{35}_{17} and Cl^{37}_{17} have been investigated. The upper limit of the mass of Cl^{35} is 34·98054. [See Abstr. 1825 (1944)]. A. J. M.

539.185 : 621.384 : 621.319.339 1827

A high-voltage apparatus for atomic disintegration experiments. CRAGGS, J. D. *Metrop.-Vick. Gaz.*, 20, *pp.* 289–295, *April*, 1944.—[Abstr. 1512 B (1944)].

539.185.9 : 537.564 1828

The ionization method of measuring neutron energy. GRAY, L. H. *Proc. Camb. Phil. Soc.*, 40, *pp.* 72–102, *March*, 1944.—The problem is the measurement of the amount of energy absorbed in unit vol. of a medium rich in H when exposed to a given beam of neutron radiation. The relation $E_v = J_v W \rho$ is critically examined, E_v is the energy absorbed per unit vol. of a solid medium, J_v is the ionization produced in a gas-filled cavity in the medium, W is the average energy expended by the ionizing particles in producing a pair of ions in the gas, and ρ is the stopping power of the solid rel. to the gas for these particles. The principles of the ionization method and the rel. stopping power of a solid and gas of identical atomic composition for fast protons are discussed. The estimation of the average energy expended by protons in the production of a pair of ions is treated and experimental results are given. Recoil atoms other than protons are briefly considered. [See Abstr. 3613 (1939) and 3207 (1940)]. L. S. G.

539.211 : 549.12 : 535.417 *see Abstr.* 1800

539.211 : 666.1 = 3 1829

Electron-microscopic examination of the fine structure of fractured-glass surfaces. GÖLZ, E. *Z. Phys.*, 120, 11–12, *pp.* 773–777, 1943.—When a glass rod is broken, the break is conveniently divided into 3 zones: (1) the mirror, (2) the serrated surface, (3) the furrowed surface. The fine structure of (2) is examined by the electron microscope, and it is shown that the individual furrows of (3) extend into (2), with decreasing fineness. An examination of the region between (1) and (2) suggests that still finer furrows may exist which are not revealed by present-day apparatus. [See Abstr. 4846 (1934), 4465 (1935), 434, 2327 (1939). L. S. G.

539.26 : 548.73 *see Abstr.* 1890

539.319 1830

A type of stress distribution on the surface of a semi-infinite elastic solid. DEAN, W. R., PARSONS, H. W., AND SNEDDON, I. N. *Proc. Camb. Phil. Soc.*, 40, *pp.* 5–19, *March*, 1944.—An external force F is applied to the interior of the solid, in a direction normal to the surface. The stress distribution on the surface is firstly obtained when F is applied at a single internal point, the result agreeing with that obtained by Mindlin [Abstr. 3001 (1936)]. It is then assumed that F is uniformly distributed over the area of a circle of radius a lying in a plane parallel to, and at a distance h from, the surface. Complications are reduced by restricting attention to an incompressible solid and simple expressions are found for the components of the surface stress and displacement. Numerical examples are given. The general case of a compressible elastic solid is briefly considered. It is shown that when h/a is small, the stress distribution can be found with fair accuracy from the much simpler distribution in an incompressible medium by the use of a single numerical factor. L. S. G.

539.4.016 : 669.72 1831

The effect of rolling temperature on the mechanical properties of a magnesium alloy. JONES, W. R. D. *J. Inst. Met.*, 70, *pp.* 149–158, *April*, 1944.—16-gauge sheets were rolled at various temperatures from 10-gauge sheets which had been produced by hot-rolling cast slabs and slabs extruded from a chill-cast circular ingot, teemed from the same ladle of molten alloy. By hot rolling direct from cast slabs, sheets can be produced which have properties at least equal to those produced from extruded slabs. Sheets rolled at 400°–450°C. are self-annealing. Two rolling procedures may be recommended for the production of sheets with optimum mechanical properties: (1) rolling at 400°–450°C., or (2) rolling at any temp. above 200° and below 400°C., followed by annealing at 300°C.

539.4.016.2 : 548.73 : 669.3 1832

The self-annealing of copper. COOK, M., AND RICHARDS, T. L. *J. Inst. Met.*, 70, *pp.* 159–173, *April*, 1944.—Observations have been made on the changes which occur spontaneously at room temperature in the X-ray and microstructure and in the physical properties of h.c. copper strip with initial grain-sizes of 0·015–0·02, 0·025 and 0·66 mm., and cold rolled with reductions in thickness of 80, 90, 95 and 97·5%. Spontaneous recrystallization at room temp. was observed only in those strips in which the average grain dia. of the crystals had been reduced to 0·0008 mm. or less. In the 64 weeks during which the observations were made, partial recrystallization with no detectable change in properties occurred in some of the strips, whilst complete recrystallization and softening occurred in strips having the smallest initial grain-size and cold-rolled with reductions of 95 and 97·5%. In the recrystallization at room temp., the structural change consists of a merging of the twin-fibre texture present in the cold-rolled strip to form the single-texture structure. The structure and properties of self-annealed strip are similar to

those of strip which, when annealed normally, has a single-texture structure.

539.4.019 1833

Thermal fatigue of metals. Boss, W., and Honeycombe, R. W. K. *Nature, Lond.*, 153, *pp.* 494–495, *April* 22, 1944.

539.501 1834

Analytical and integrative aspects of the stress/strain/time problem. Blair, G. W. Scott. *J. Sci. Instrum.*, 21, *pp.* 80–84, *May*, 1944.—A review is given of the different methods of approach to the foremost problem of rheology, the relation between stress, strain and time in complex materials. The analytical approach regards the material as a physical mixture of ideal Hookean and Newtonian components. In the integrative view, the molecular conditions are considered as too complex to justify the use of ideal models. It depends upon the principle of intermediacy and is essentially a field concept. Psychophysical experiments have shown the advantages of the latter approach in studying those industrially important concepts, such as "firmness," which cannot be expressed in dimensionally simple terms. L. S. G.

541.123.2 1835

The system ammonium-nitrate–sodium-nitrate. Holmes, E. O., Jr., and Revinson, D. *J. Amer. Chem. Soc.*, 66, *pp.* 453–457, *March*, 1944.—The solubility curves for the 2 forms of NH_4NO_3 are linear while that for $NaNO_3$ is parabolic. An improved microtechnique was developed that gives good results except near the eutectic point. The eutectic temperature was $(121{\cdot}2 \pm 0{\cdot}2)°$ and the transition temperature $(126{\cdot}2 \pm 0{\cdot}2)°$ by the cooling-curve method. The eutectic composition was $(21{\cdot}0 \pm 0{\cdot}1)\%$ $NaNO_3$ and the transition composition $(18{\cdot}0 \pm 0{\cdot}1)\%$.

541.123.3 1836

Investigation of the system chromium-silicon-iron in the region of silicochrome. Kurnakov, N. N. *C.R. (Doklady) Acad. Sci. URSS*, 34, 6, *pp.* 158–159, 1942.—The system was examined by thermal analysis and examination of microstructure. A preliminary diagram of the location of phases is drawn. A. E. T.

541.123.31 1837

The system potassium-carbonate–sodium-carbonate–water at 100° and 150°. Ervin, G., Jr., Giorgi, A. L., and McCarthy, C. E. *J. Amer. Chem. Soc.*, 66, *pp.* 384–387, *March*, 1944.—The usual chemical methods were analysed and the solid phases identified by microscopic examination and X-ray patterns. At 100° the isotherm has 3 branches: $K_2CO_3 . {}^3/_2H_2O$, $K_2CO_3 . Na_2CO_3$, and $Na_2CO_3 . H_2O$. The 150° isotherm also has 3 branches: $K_2CO_3 . {}^3/_2H_2O$, $K_2CO_3 . Na_2CO_3$, and Na_2CO_3. The field of the double salt is slightly more extensive here than at 100°. The double salt is incongruently soluble in the temperature range studied and decomposes in contact with water to give solid $Na_2CO_3 . H_2O$ or Na_2CO_3 plus a solution relatively richer in K_2CO_3.

541.124 : 547.914.2 1838

The hydrogenolysis of abietic acid. Charmbury, H. B., and Wright, C. C. *J. Amer. Chem. Soc.*, 66, *pp.* 526–532, *April*, 1944.—The hydrogenolysis of abietic acid for 2 hr. at 325° to 450° and initial H pressure of 1 900 to 1 975 lb./in.^{2} and also at 400° for 1, 2 and 3 hr. at the same pressure has shown that: (1) The amount of unconverted acidic material is appreciable at 325° but decreases to practically zero at 450°. (2) The removal of O takes place as a straight decarboxylation with the formation of CO_2 in the early stages. (3) The total percentage of O removed is $\propto$ the temp. of hydrogenolysis and is virtually complete at 450°. (4) The formation of CO results from the reduction of CO_2. (5) Depropylation does not occur up to about 380°, but increases rapidly above this temp. (6) Depropylation is a function of H conc. or partial pressure of H. (7) Part of the ethane results from the cracking of propane. (8) Severance of one of the methyl groups occurs even at the lower temperatures and is a function of time and H conc. (9) Alicyclic decomposition does not occur up to 425°, but increases rapidly above this temp. and is a function of H conc. (10) The H consumption at lower temp. is due to the partial saturation of the ethylenic linkages and at higher temp. to the alkyl and alicyclic decomposition as well as to the reduction of the oxides of carbon.

541.124 : 662.231 1839

Nitration of cellulose. I. Nitration in the vapour of nitric acid. Wilson, G. L., and Miles, F. D. *Trans. Faraday Soc.*, 40, *pp.* 150–163, *May*, 1944.—A study at 4 to 16 mm. Hg pressure and 20° to 40° on weighed bundles of ramie cellulose suspended on a quartz-spring balance and subjected to a stream of HNO_3 vapour for times up to 40 hr. The product was analysed and the degree of nitration found. Measurements were also made at several temps. and pressures of the absorption of HNO_3 mols. on fully nitrated cellulose. Results show that absorption of HNO_3 on the fibres takes place and that this, and the consequent nitration, reaches a max. in about 3 hr. The rate of nitration is independent of the pressure of HNO_3 vapour in the gas phase, but is approx. $\propto$ the square of the amount of acid which is absorbed without chemical reaction. The reaction indicated is $-OH + 2HNO_3 = -O . NO_2 + HNO_3 . H_2O$. A modification, with two correction terms, of the simple equation: rate of nitration = K (absorbed $HNO_3)^2$ is discussed, the evaluation of these terms is described, and calc. and experimental vals. of the reaction rate are compared. N. M. B.

541.124 : 678 1840

Rubber, polyisoprenes, and allied compounds. VI. The mechanism of halogen-substitution reactions, and the additive halogenation of rubber and of dihydromyrcene. Bloomfield, G. F. *J. Chem. Soc.*, *pp.* 114–120, *April*, 1944.—The chlorination of *cyclo*hexene by Cl or by sulphuryl chloride (in the absence of a peroxide catalyst) yields substituted as well as additive chlorination products, and the former retain in full the original olefinic unsaturation as indicated by iodine-value determination. No evidence of substitution at the ethylenic methine C atom has been obtained in the chlorination of *cyclo*hexene, dihydromyrcene, and rubber, by Cl. The diminished unsaturation of the chloro-substitution products of the last two hydrocarbons is attributed to cyclization. The same cyclizing tendency appears in the substitutive bromination of rubber by *N*-bromosuccinimide, but not in bromination of dihydromyrcene. Additive

chlorination products are formed when rubber is brought into reaction with Cl liberated by the thermal dissociation of phenyliodochloride, or of sulphuryl chloride in the presence of a peroxide. The mode of reaction of Br with rubber is entirely additive if the solvent contains a trace of alcohol and the temp is 0°. A method based on Br addition may be used for estimating rubber hydrocarbon. Additive bromo- and chloro-derivatives of rubber are comparatively stable and give no indication of the spontaneous elimination of halogen acid either through cyclization reactions or the re-formation of double bonds at temp. up to 80°.

541.124 : 678 1841

Rubber, polyisoprenes, and allied compounds. VII. Action of nitric oxide thereon. BLOOMFIELD, G. F., AND (IN PART) JEFFREY, G. A. *J. Chem. Soc.*, *pp.* 120–124, *April*, 1944.—The reaction of NO with *cyclo*hexene, 1-methyl*cyclo*hexene, dihydromyrcene, and rubber, presents characteristics of a free-radical, chain reaction. In the products, the mol. ratio of combined O to N is $>1:1$, the N atom being generally directly linked to C. In many instances definite nitro-compounds have been isolated, and a considerable part of the attack appears to proceed at the ethylenic C atoms, either by substitution or addition of NO_2 and N_2O_3 groups. The precise reaction mechanism is obscure.

541.124.2 : 577.15.022 1842

A new method for the measurement of tyrosinase catecholase activity. II. Catecholase activity based on the initial reaction velocity. MILLER, W. H., MALLETTE, M. F., ROTH, L. J., AND DAWSON, C. R. *J. Amer. Chem. Soc.*, 66, *pp.* 514–519, *April*, 1944.—A chronometric method based on the indirect titration of *o*-benzoquinone is described for following the initial reaction course during the enzymatic oxidation of catechol. The initial reaction velocity may be determined and used for calculation of the catecholase activity of tyrosinase. The value of catecholase activities based on the initial reaction velocity, particularly when comparing enzymes having different inactivation characteristics, is discussed.

541.124.7 1843

Allylic rearrangements. XIV. The hydrolysis of butenyl chlorides. YOUNG, W. G., AND ANDREWS, L. J. *J. Amer. Chem. Soc.*, 66, *pp.* 421–425, *March*, 1944.—Kinetic studies of the reaction of the isomeric chlorides in dilute solutions of NaOH in aq. ethanol showed that the secondary chloride reaction rate was independent of hydroxide ion; the primary chloride, however, showed both first- and second-order kinetics. Evidence was obtained that the first-order reaction of the primary chloride is in part a bimolecular reaction with solvent.

541.124.7 1844

The hydrolysis of pantothenate: a first-order reaction. Relation to thiamin stability. FROST, D. V., AND MCINTIRE, F. C. *J. Amer. Chem. Soc.*, 66, *pp.* 425–427, *March*, 1944.—Hydrolysis of pantothenate in acid solution follows a first-order relation with resp. to pantothenate conc. The activation energy of the reaction is 19 000 cal., corresp. to an increment per 10° of 2·6.

541.124.7 1845

Acid-base studies in gaseous systems. I. Precise dissociation measurements. BROWN, H. C., TAYLOR, M. D., AND GERSTEIN, M. *J. Amer. Chem. Soc.*, 66, *pp.* 431–435, *March*, 1944.—A simple technique was developed and tested by a series of studies on the dissociation of trimethylamine-trimethylboron. The tests indicate that by this method the dissociation constants can be determined to 2% and the heat of dissociation to 0·1%.

541.124.7 : 535.338.4 *see Abstr.* 1792

541.124.7 : 541.132.3 *see Abstr.* 1854

541.124.7 : 541.636 1846

Acid-base studies in gaseous systems. II. The anomalous base strength of the methylamines: a new manifestation of steric strain. BROWN, H. C., BARTHOLOMAY, H., JR., AND TAYLOR, M. D. *J. Amer. Chem. Soc.*, 66, *pp.* 435–442, *March*, 1944.—The dissociation of the trimethylboron addition compounds with ammonia, methylamine, dimethylamine and trimethylamine in the vapour phase ($R_3N:BMe_3 \rightleftarrows R_3N: + BMe_3$) was studied; ΔH, ΔF and ΔS for the reactions were measured. The rel. affinity of the methylamines for trimethylboron (measured by the dissociation const. of the complex) is identical with their affinity for the proton (measured by the dissociation const. of the base). In both instances, the base strength rises from ammonia to methylamine and to dimethylamine, but drops sharply from dimethylamine to trimethylamine. The strain resulting from the steric factor is divided into B-strain and F-strain. The anomalous behaviour of the methylamine is ascribed to B-strain.

541.126 1847

On the explosion limit of oxyhydrogen gas at atmospheric pressure. ZISKIN, M. S. *C.R. (Doklady) Acad. Sci. URSS*, 34, 9, *pp.* 256–258, 1942.—Describes an experimental investigation of the explosion temperatures of the $2H_2 + O_2$ mixture, in cylindrical vessels of length 12 cm. and dia. from 5·5 to 30 mm. The temperature was slowly increased, the gas flow being continuous and at a rate approx. $\propto$ the volume of the vessel. The rate of flow did not affect the explosion temperature. The experimental results are plotted as a function of dia. of the explosion vessel; they agree with recent theoretical values. A. E. T.

541.126 : 547.281.2 1848

The thermal decomposition of acetaldehyde. MORRIS, J. C. *J. Amer. Chem. Soc.*, 66, *pp.* 584–589, *April*, 1944.—The thermal decomposition of mixtures of acetaldehyde and acetaldehyde-d_4 was carried out and the resulting methanes analysed by infra-red absorption spectra. The decomposition is a true unimolecular reaction and chain processes play a very minor part. This was confirmed by studies on the abs. rate of decomposition, which show the true rates to be only $^1/_2$ as great as those previously observed. The rel. rate of thermal decomposition of acetaldehyde to that of acetaldehyde-d_4 is approx. 1·3–1·4.

541.127 : 541.64 1849

The steady-state approximation in polymerization kinetics. STOCKMAYER, W. H. *J. Chem. Phys.*, 12, *pp.* 143–144, *April*, 1944.

541.127.1 1850

The influence of *n*-alkyl groups on the rate of a cyclization reaction. BERLINER, E. *J. Amer. Chem. Soc.*, 66, *pp.* 533–535, *April*, 1944.—The rate of the cyclization of different ketones to 9,10-disubstituted anthracenes was measured and found to decrease as the number of C atoms on the alkyl groups increases. The decrease in rate can be explained in terms of the inductive effect of alkyl groups. A number of 9-alkyl-10-methylanthracenes was prepared and the physical constants are described.

541.127.1 : 541.128.1 1851

Electrolyte catalysis in the ammonolysis of 9-phenyl-9-chlorofluorene by liquid ammonia. WILLIAMSON, P. M., ANDERSON, R. C., AND WATT, G. W. *J. Amer. Chem. Soc.*, 66, *pp.* 376–379, *March*, 1944.—The influence of NaCl, $NaNO_3$ and NH_4NO_3 upon the rate of ammonolysis of 9-phenyl-9-chlorofluorene is described. Values for the reaction velocity constants and energy of activation are recorded. This reaction is subject to electrolyte catalysis by ammonium salts and by non-onium type salts.

541.127.3 : 674.049 *see Abstr.* 1917

541.128.1 1852

Generalized acid-base catalysis. I. Condensation of *o*-benzoylbenzoic acid in sulphuric acid. LUDER, W. F., AND ZUFFANTI, S. *J. Amer. Chem. Soc.*, 66, *pp.* 524–526, *April*, 1944.—An explanation of some effects in the catalysed condensation of *o*-benzoylbenzoic acid to anthraquinone is given according to the electronic theory of acids and bases. An alternative mechanism is proposed, but it is shown that the application of the Lewis theory is equally valid for both mechanisms considered.

541.128.1 : 541.127.1 *see Abstr.* 1851

541.132 1853

The dissociation of hexa-arylethanes. XV. Methoxyl substituents. MARVEL, C. S., WHITSON, J., AND JOHNSTON, H. W. *J. Amer. Chem. Soc.*, 66, *pp.* 415–417, *March*, 1944.—Redetermination of the degrees of dissociation of methoxyl-substituted hexa-arylethanes by the magnetic-susceptibility method shows that the values determined by cryoscopic mol. wt. values are too high, owing to the instability of these ethanes. The new values show that the *o*-methoxyl group is much less effective than the *o*-methyl group in causing dissociation. In the *m*- and *p*-positions the methoxyl groups are also less effective than methyl groups but the difference is less marked.

541.132.3 : 541.124.7 1854

Effect of metallic ammine salts on the *p*H of phosphate buffer solutions. COBB, L. H., AND ANDERSON, J. S. *Trans. Faraday Soc.*, 40, *pp.* 145–150, *May*, 1944.—Results tabulated and plotted for a range of conc. of uni-trivalent cobaltammine salts show that a large effect on the H ion activity, exceeding 1 *p*H unit at moderate ionic strengths, is produced. The *p*H of the solutions is a linear function of the log (ammine), and the slope of the curve for different ammines (Co, Pt, Ir) agrees with the relations found between conc. of ammine and rate of H isotope interchange. N. M. B.

541.133 1855

Temperature coefficients of electrical conductance of solutions containing sodium chloride, potassium chloride or magnesium sulphate or mixtures thereof. BREMNER, R. W. *J. Amer. Chem. Soc.*, 66, *pp.* 444–446, *March*, 1944.—An equation is recommended for calculating the equivalent conductances of solutions as a function of temperature. By the differentiated form of the equation, the temp. coeff. of equivalent conductance of 20 different solutions were calculated with 5-place accuracy. Temp. coeff. of sp. conductance were calculated for the conductivity water used and for 0·01 demal and 0·1 demal std. KCl solutions. Variations of temp. coeff. of electrical conductance of the salt solutions, due to conc. changes, temp. changes and the addition of a second salt, are determined.

541.133.1 1856

The concentration distribution in two-salt moving boundaries. LONGSWORTH, L. G. *J. Amer. Chem. Soc.*, 66, *pp.* 449–453, *March*, 1944.—Salt boundaries of the type used for the direct determination of transference numbers were studied with the scanning camera. Several features of the direct moving-boundary method that were assumed in previous work are confirmed experimentally. Under the influence of a const. current, the conc. distribution through a moving boundary does not change with the time, and is given accurately by Weber's theory. The adjusted conc. of the indicator solution, and hence its transference number, may be determined from the electrophoretic patterns.

541.135.5 1857

Donnan membrane potential. CHAUDHURY, S. G. *Nature, Lond.*, 153, *p.* 593, *May* 13, 1944.—[See Abstr. 2424 (1943)].

541.141.1 : 541.64 1858

The mercury-photosensitized polymerization of acetylene. ROY, D. J. LE, AND STEACIE, E. W. R. *J. Chem. Phys.*, 12, *pp.* 117–124, *April*, 1944.—The polymerization is inhibited by NO and it is concluded that free radicals are involved. The quantum yield of the uninhibited reaction is $4{\cdot}5 \pm 1{\cdot}2$. Experiments over the range 25° to 300°C. show that the temp. coeff. of the reaction is not large. A few measurements were made with $Cd(^3P_1)$ and $Cd(^1P_1)$ atoms. [See Abstr. 944 (1943)].

541.144 : 637.1 1859

Destruction of riboflavin in milk by sunlight. PETERSON, W. J., HAIG, F. M., AND SHAW, A. O. *J. Amer. Chem. Soc.*, 66, *pp.* 662–663, *April*, 1944.

541.182.5 1860

Studies on silicic acid gels. XV. The effect of temperature upon the time of set of alkaline gel mixtures. HURD, C. B., POMATTI, R. C., SPITTLE, J. H., AND ALOIS, F. J. *J. Amer. Chem. Soc.*, 66, *pp.* 388–390, *March*, 1944.—In the *p*H range above 10·5, rise of temperature produces increase in time of set. Rise of temperature accelerates the process of dissolving of the gel to a greater extent than it accelerates gel formation. In mixtures with $pH > 11$, the solution process is predominant and gels do not form. During the process of setting, the *p*H of these poorly buffered alkaline mixtures increases con-

siderably. No thermally reversible silicic acids were found. Alkaline gels are softer and less elastic than acid gels.

541.182.5 1861

Studies on silicic acid gels. XVI. The effect of radiant energy upon the time of set. HURD, C. B., AND DAY, W. U. *J. Amer. Chem. Soc.*, 66, *pp.* 391–392, *March*, 1944.—Radiations from a Mazda lamp, a capillary Hg arc and an iron spark were used. No significant effects of these types of radiation on the time of set were found.

541.182.5 : 541.64 1862

Theory of molecular-size distribution and gel formation in branched polymers. II. General cross linking. STOCKMAYER, W. H. *J. Chem. Phys.*, 12, *pp.* 125–131, *April*, 1944.—[See Abstr. 1232 (1943)]. A statistical calculation of the gel point and of the molecular-size distribution is made for cross-linked high polymers of arbitrary initial size distribution. The weight-average polymerization degree of the cross-linked polymer depends only on the weight-average polymerization degree of the initial polymer and the degree of cross-linking. The results obtained also apply to certain vinyl-divinyl copolymers. Polymerization degrees can be estimated from observations of the gel point.

541.182.5 : 547.96 1863

The linkage of corpuscular protein molecules. I. A fibrous modification of insulin. WAUGH, D. F. *J. Amer. Chem. Soc.*, 66, *p.* 663, *April*, 1944.

541.182.6 1864

Low-temperature saponification in anhydrous systems. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res.B*, 22, *pp.* 76–88, *May*, 1944.—Finely dispersed NaOH, suspended in mineral oil, was used to saponify fatty acids and fats in mineral oil solution. Saponification was carried rapidly to completion at 60°C. The properties of the resultant soap suspensions in oil are discussed. The degree of saturation of the fatty acids or fats is of importance in the viscosity of the suspension formed. Low-mol. wt. fatty acids down to acetic were also saponified by this method. Only mutton tallow was completely saponified at low temperature. Finely dispersed $Ca(OH)_2$ in mineral oil suspension effects complete saponification of fatty acids in mineral oil solution at 50°C. and of mutton tallow at a somewhat higher temperature. The effect of deg. of unsaturation, and the use of other fats, are discussed. Small quantities of added water promote saponification. This saponification procedure was used also to prepare suspensions in oil of Al, Mg, Ba, Pb and Li soaps.

541.182.6 : 548.53 1865

The recrystallization of sodium soaps in mineral oils. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res.B*, 22, *pp.* 90–102, *May*, 1944.—The effect of the following factors on the recrystallization of Na soaps in mineral oils is described: rate of cooling, acidity and alkalinity of the soap, conc. of the soap, unsaturation in the soap, polarity of the oil, effect of a number of additives such as glycerol, and external shearing forces. Non-polar mineral oil acts as an inert diluent and recrystallization is essentially that from a hot melt. The presence of polar compounds results in some solvent action on soap in the meso-morphic states and the effect of shear on the form of the recrystallized soap in such systems is important. The preparation of a sodium soap lubricating grease is essentially a recrystallization of the soap, and the properties of the grease can be altered over a wide range by suitable adjustment of the factors during the recrystallization.

541.182.6 : 548.53 1866

The effect of high shearing stresses on recrystallization of sodium soaps in mineral oils. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res.B*, 22, *pp.* 103–108, *May*, 1944.—High shearing stresses obtained by use of the colloid mill are shown to bring about recrystallization of Na soaps at temperatures above the plasticity point of the soap. Below this temperature a comminuting action only on the soap in suspension is obtained. The length of soap fibre produced in the recrystallization increases with increase in polarity of the oil and with decrease in viscosity of the oil. The fibre length increases particularly markedly with increase of degree of unsaturation of the soap. The addition of glycerol or fatty acid has little effect. The action of the shearing stress is discussed and it is concluded that long crystals are produced by a shearing of the double soap molecules on slip planes between melted hydrocarbon chains. The recrystallization is thus induced on molten portions of the soap.

541.183.022 : 536.658 : 539.133 *see Abstr.* 1819

541.183.56 1867

Adsorption of gases on smooth surfaces of steel. ARMBRUSTER, M. H., AND AUSTIN, J. B. *J. Amer. Chem. Soc.*, 66, *pp.* 159–171, *Feb.*, 1944.—Measurements are reported of the adsorption on conditioned cold-rolled steel, with and without reduction by H_2, of A, Ne, H_2, N_2, CO, and CO_2 at 20°, − 78°, − 183° and − 195° and at pressures up to 0·1 cm. H_2 and Ne were not measurably adsorbed. The isotherms are believed to be the l.p. section of an isotherm of the sigmoid type characteristic of adsorption on Fe catalysts; they are represented by a combination of the Freundlich and Langmuir relations. The heat of the adsorption calc. by the Emmett–Brunauer–Teller equation is, for all the physically held sorption, approx. 3 000 cal./mole. Force/area curves for the sorbed films show that when some of the gas is held to the surface very strongly, phase transformations similar to those occurring in monomol. films on water may take place. N. M. B.

541.24 : 547.962.3 1868

Molecular weight of egg albumin. GUTFREUND, H. *Nature, Lond.*, 153, *p.* 406, *April* 1, 1944.

541.6 : 537.533.73 : 547.29 1869

An electron diffraction investigation of the monomers and dimers of formic, acetic and trifluoroacetic acids and the dimer of deuterium acetate. KARLE, J., AND BROCKWAY, L. O. *J. Amer. Chem. Soc.*, 66, *pp.* 574–584, *April*, 1944.—The structures of the monomeric and dimeric forms of formic, acetic and trifluoroacetic acids in the vapour state were investigated by the electron diffraction method [see Abstr. 4358 (1936)]. The two C–O bonds in the carboxyl group differ in both the monomer and the dimer. The OH–O distance across the bridge is substantially the same in all 3 dimers, while in the acetic acid the

C–C bond is 0·06 Å, longer than in the F-substituted acid. Acetic acid and the deuterated acid show no detectable difference in their diffraction photographs. Measurements were made on the vapour density and the dissociation constants of the dimeric trifluoroacetic acid.

541.61 : 546.174 1870

Structure of the nitrogen peroxide molecule. LONGUET-HIGGINS, H. C. *Nature, Lond.*, 153, *pp.* 408–409, *April* 1, 1944.

541.62 1871

Conjugated diolefins by double bond displacement. II. HENNE, A. L., AND CHANAN, H. H. *J. Amer. Chem. Soc.*, 66, *pp.* 395–396, *March*, 1944.—[See Abstr. 2722 (1942)]. Twelve dienes of the 1,5-type were subjected to double bond shift at 250° over a catalyst made of chromia and alumina. Seven were transformed to conjugated diolefins, while five failed to re-arrange to any appreciable extent.

541.636 : 541.124.7 *see Abstr.* 1846

541.64 : 541.127 *see Abstr.* 1849

541.64 : 541.141.1 *see Abstr.* 1858

541.64 : 541.182.5 *see Abstr.* 1862

542.4 : 621.369.4 1872

Electric heater for microprocedures and melting points. CIFONELLI, T. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 134–136, *Feb.* 17, 1944.—[Abstr. 1529 B (1944)].

542.47 1873

A simplified lyophil apparatus. CAMPBELL, D. H., AND PRESSMAN, D. *Science*, 99, *pp.* 285–286, *April* 7, 1944.

542.64 : 532.71 *see Abstr.* 1770

543.812 : 691.11 1874

Moisture absorption in timbers. PITTS, G. Y. *Mod. Refrig.*, 47, *pp.* 112–113, *May*, 1944.—Describes an experiment to ascertain the rel. value of timbers in resisting absorption of water. The test involved drying out the samples in an oven to const. wt. and exposure to air in a room for a period of 10 days during which most of the samples took up a certain amount of moisture. The humidity of the air was ascertained on several occasions and varied from 68 to 72%; the temperature varied from 67° to 70°F.

545.3 : 669.3 : 669.1 1875

Electrolytic determination of copper in steel and cast iron. LEVINE, W. S., AND SEAMAN, H. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 80–82, *Feb.* 17, 1944.—Copper is determined electrolytically in the presence of ferrous iron with the use of an Alundum thimble as a diaphragm. The sample is dissolved in dilute H_2SO_4 and the Cu oxidized by $Fe_2(SO_4)_3$ or HNO_3. Satisfactory results have been obtained on carbon and low-alloy steels and cast irons by direct weighing of the cathode. Steels containing much Mo, W or Cr require that the plating be dissolved and the Cu determined colorimetrically.

545.82 : 535.33 *see Abstr.* 1791

545.822 : 518.5 1876

A graphic calculator for spectrochemical analyses. VANSELOW, A. P., AND LIEBIG, G. F., JR. *J. Opt. Soc. Amer.*, 34, *pp.* 219–221, *April*, 1944.

545.824 : 548.73 *see Abstr.* 1891

546.17 : 539.132 *see Abstr.* 1818

546.172.6 : 535.338.4 *see Abstr.* 1793

546.174 : 541.61 *see Abstr.* 1870

546.45 : 536.655 : 536.423.15 *see Abstr.* 1807

547.281.2 : 541.126 *see Abstr.* 1848

547.29 : 537.533.73 : 541.6 *see Abstr.* 1869

547.457 : 536.63/.65 *see Abstr.* 1809

547.458.6 : 532.712 : 539.133 : 532.133 *see Abstr.* 1760

547.458.8 : 532.13 *see Abstr.* 1757

547.599.6 : 532.77 *see Abstr.* 1776

547.63 : 535.343-31 *see Abstr.* 1794, 1795

547.914.2 : 541.124 *see Abstr.* 1838

547.96 : 541.182.5 *see Abstr.* 1863

547.962.3 : 541.24 *see Abstr.* 1868

548.0 : 535.338 1877

The vibration spectrum of a crystal lattice. RAMAN, C. V. *Proc. Indian Acad. Sci. A*, 18, *pp.* 237–250, *Nov.*, 1943.—Starting from the most general expression for the potential energy of the displacements of the atoms from their equilibrium positions, their normal modes of vibration are derived. Equivalent atoms have all the same amplitude and either the same phase or alternately opposite phases in the successive cells of the lattice along each of its 3 edges. The vibration modes are analogous to that of a molecule with the appropriate symmetries and containing 8 times the number of atoms in the lattice cell. The spectrum consists of a discrete set of monochromatic frequencies, the number of which is finite and is further reduced when the crystal belongs to a highly symmetric class. The small residue of degrees of freedom not included appears as quasi-elastic vibrations of specifiable low frequencies.

548.0 : 535.338 1878

Normal oscillations of the diamond structure. BHAGAVANTAM, S. *Proc. Indian Acad. Sci. A*, 18, *pp.* 251–256, *Nov.*, 1943.—Group theoretical methods are applied for obtaining the normal oscillations of the diamond structure on the basis of a 16-atom cell as the repeating unit. Besides the translation, there are 8 normal oscillations, 1 of which is 3-fold degenerate, 2 of which are 4-fold degenerate, 3 of which are 6-fold degenerate and 2 of which are 8-fold degenerate. Expressions are derived for the corresponding normal frequencies by postulating suitable potential-energy functions.

548.0 : 535.338 1879

The normal vibrations in some typical cubic crystals. CHELAM, E. V. *Proc. Indian Acad. Sci. A*, 18, *pp.* 257–265, *Nov.*, 1943.—The normal modes of vibration of the simple cubic, body-centred and face-centred lattices as well as of the zincblende, diamond, rock-salt, fluorspar and Co chloride lattices are derived by geometric methods. The lattices mentioned have 5, 4, 4, 9, 8, 9, 14 and 11 distinct frequencies, respectively.

548.0 : 535.338 1880

Modes of atomic vibration in the fourteen Bravais lattices. RAMACHANDRAN, G. N. *Proc. Indian Acad. Sci. A*, 18, *pp.* 266–282, *Nov.*, 1943.—The degeneracies and the directions of the normal modes of vibration

in the 14 Bravais lattices are worked out from symmetry considerations. Denoting the ratio of the displacements of adjacent atoms along the primitive translations by α, β, γ, these can have only the values $+1$ or -1, so that the vibrations fall into 8 types in the general case of no symmetry. In lattices possessing symmetry, some of the types could be brought over into others by the application of symmetry operations. Also the directions of motion in any particular type of vibration may be equivalent. This is determined by selecting a group of operations which brings the atoms of the same phase to coincide for that type of vibration, and finding the directions of motion which satisfy the symmetry requirements of this group. In this way, both the directions of motion and their degeneracies are known.

548.0 : 535.338 1881

The frequency spectrum of the diamond lattice. CHELAM, E. V. *Proc. Indian Acad. Sci. A*, 18, *pp.* 334–340, *Nov.*, 1943.—The eight frequencies in a diamond lattice are calculated with a suitable force field and explicit expressions are given for them.

548.0 : 535.338 1882

Modes of vibration of the hexagonal close-packed lattice. RAMACHANDRAN, G. N. *Proc. Indian Acad. Sci. A*, 18, *pp.* 341–344, *Nov.*, 1943.—The modes of vibration of the hexagonal close-packed structure is worked out on the basis of the Raman theory. The character tables are drawn up, and the vibrations are derived. There are 13 vibrations with degeneracies 1, 2, 2, 4, 3, 3, 3, 3, 3, 3, 6, 6, 6. The planes which take part in each mode and the direction of vibration for these are described.

548.0 : 535.338 : 519.4 1883

Normal vibrations of crystal lattices: application of group theory. CHELAM, E. V. *Proc. Indian Acad. Sci. A*, 18, *pp.* 283–297, *Nov.*, 1943.—A group theoretical method to deal with the harmonic vibrations of a general crystalline lattice is indicated. It is shown how the normal modes, frequencies and their degeneracies can be rigorously derived.

548.0 : 535.338 : 519.4 1884

Character tables for the atomic vibrations in some cubic crystals. CHELAM, E. V. *Proc. Indian Acad. Sci. A*, 18, *pp.* 327–333, *Nov.*, 1943.—Character tables for groups associated with vectors defining normal modes are given for 4 cubic crystals based on a face-centred Bravais lattice: rock-salt, diamond, zinc-blende and fluorite. The method of deriving normal modes from these tables is illustrated.

548.0 : 535.372 1885

Luminescence spectra and vibrations in crystal lattices. PANT, D. D. *Proc. Indian Acad. Sci. A*, 18, *pp.* 309–326, *Nov.*, 1943.—A general survey of the known luminescence spectra of crystals is given. Those which give discrete spectra are divided into 7 classes. The luminescence spectrum of each of these is examined. The information is supplemented by the evidence furnished by the complementary absorption spectra. There is evidence that vibrational frequencies are sharp and monochromatic in all crystals. Those luminescence spectra which are not discrete, are due to an electronic transition in which 1 or both the electronic states involved are not sharp. In many crystals some of the constituents behave as if they are in the gaseous state.

548.0 : 535.375.5 1886

Raman spectra of crystals and their interpretation. KRISHNAN, R. S. *Proc. Indian Acad. Sci. A*, 18, *pp.* 298–308, *Nov.*, 1943.—An examination of the spectrograms of the Raman effect in rock-salt obtained by Rasetti reveals the existence of 9 distinct Raman lines both on the Stokes and on the anti-Stokes sides. The frequency shifts and rel. intensities of these lines as well as the intensity ratios of the Stokes to the anti-Stokes lines are evaluated. The 9 frequencies are identified as due to the 9 distinct modes of vibration of the NaCl lattice to be expected on the basis of the Raman dynamics. Though these vibrations are forbidden in the Raman effect as fundamentals, they are allowed as octaves and appear as such in the spectrum. The Born theory of crystal dynamics is not capable of offering any satisfactory explanation for the observed facts.

548.0 : 669.018 *see Abstr.* 1916

548.32 1887

Roozeboom's type II of solid solution. CAMPBELL, A. N. *Nature, Lond.*, 153, *p.* 530, *April* 29, 1944.

548.53 : 541.182.6 *see Abstr.* 1865, 1866

548.73 1888

Crystal structure of boron carbide B_4C. ŽDANOV, H. S., AND SEVASTIANOV, N. G. *C.R. (Doklady) Acad. Sci. URSS*, 32, 6, *pp.* 432–434, 1941.—Powders and single crystals of B_4C were examined by X-ray methods, the crystals being obtained (*a*) from the gas phase, (*b*) from melt. In all cases only 1 crystal form was found. A full structure investigation by the Laue rotation and oscillation methods was carried out, [210] and [001] rotation photographs showing the edges of the unit cell to be $a = 5{\cdot}60$ Å; $c = 12{\cdot}1$ Å. The 2-dimensional Patterson series constructed for the projection on the [001] plane gave maxima extended along the symmetry planes so that the atoms are probably placed in these planes. The structure of B_4C was found by the trial-and-error method, calculations being made of all possible models of the structure, assuming the unit cell to contain 14, 15 or 16 atoms. L. S. G.

548.73 1889

Some peculiarities of the process of plastic deformation in gypsum crystals. WAINSTEIN, E. *C.R. (Doklady) Acad. Sci. URSS*, 34, 9, *pp.* 249–251, 1942.—X-ray photographs furnish evidence that the process of plastic deformation in a gypsum crystal is associated with marked curvatures of the atomic planes in the crystal. A. E. T.

548.73 : 535.34 : 537.531 *see Abstr.* 1812

548.73 : 539.26 1890

X-ray divergent-beam photography as a test of crystal perfection. LONSDALE, K. *Nature, Lond.*, 153, *pp.* 433–434, *April* 8, 1944.—[See Abstr. 723 (1944)].

548.73 : 545.824 1891

Quantitative determination of crystalline materials by X-ray diffraction. GROSS, S. T., AND MARTIN, D. E. *Industr. Engng Chem. (Analyt. Edit.)*, 16, *pp.* 95–100, *Feb.* 17, 1944.—A method is described for using X-ray diffraction patterns for chemical

analysis of crystalline compounds. The line intensities, which are recorded by a suitable microphotometer, are corrected by a simple graphical correction based upon an internal std., to an arbitrary basis for all comparisons. The accuracy of the method is limited by the microphotometer, grain size of the film, exposure relations, possibility of solid solution, and will ordinarily be within 5% of the observed value. Mixtures of materials are readily analysed from a single pattern, after std. patterns are taken to determine the characteristic constants. Data are given for several compounds.

548.73 : 669.3 : 539.4.016.2 *see Abstr.* 1832

549.12 : 539.211 : 535.417 *see Abstr.* 1800

550 1892

Geophysical laboratory. ADAMS, L. H. *Carneg. Instn Yearb., No.* 42, *pp.* 27–29, 1942–1943.—Annual report.

550.341 1893

Further developments in the wavelet theory of seismogram structure. RICKER, N. *Bull. Seism. Soc. Amer.*, 33, *pp.* 197–228, *July*, 1943.—The wavelet theory [Abstr. 363, 2513 (1941)] is extended to obtain the form of the seismic disturbance (due to a sharp seismic pulse) at various distances from the source. The solution of Stokes's differential equation is given in the form of a series of wavelet functions, and calculated seismograms are presented to show the manner in which the shape, breadth and amplitude of the disturbance vary with the distance from the source. Tables are given of the wavelet functions and wavelet-form functions used in the calculations.

550.381 1894

Department of terrestrial magnetism. FLEMING, J. A. *Carneg. Instn Yearb., No.* 42, *pp.* 31–59, 1942–1943.—Annual report.

550.385 : 523.752 *see Abstr.* 1743, 1744

550.42 1895

Thorium-uranium ratios in rocks and minerals. KEEVIL, N. B. *Amer. J. Sci.*, 242, *pp.* 309–321, *June*, 1944.—Recent determinations of Th/U ratios, incl. some new data, are assembled and plotted in frequency distribution curves. A probable value of 3·2 is indicated for basic, acidic and intermediate rocks, but regional grouping of the results suggests that the ratio may be as high as 3·5. Independent confirmation that the Th/U ratio lies within this range is obtained from Nier's determinations of abundances of Pb isotopes from samples of ore-lead. This leads to no significant error in α-counting theory, in determinations of the rate of production of radiogenic heat, or in determinations of the rate of accumulation of He and Pb in rocks.

550.42 : 550.93 1896

Radioactive substances. III. The analysis and age of a North Carolina monazite. BLISS, A. D. *Amer. J. Sci.*, 242, *pp.* 327–330, *June*, 1944.—A monazite from Spruce Pine, N. Carolina, was analysed for Th (4·83%), U (0·02%), and Pb (0·13%). The age as calculated by the customary formula is approximately 600 million years.

550.93 1897

Alpha-helium method for determining geological ages. EVANS, R. D., AND GOODMAN, C. *Phys. Rev.*, 65, *pp.* 216–227, *April* 1 *and* 15, 1944.—New techniques for determining the rate of He production in igneous rocks by counting of the α-rays, combined with removal and measurement of the He accumulated in a rock specimen during geologic time, provide a method of He age analysis free from chemical manipulation. Equations are derived which relate the true rate of production of He to the observed rate of α-particle emission from a thin source. Intercheck radioactivity measurements have established the mutual reliability of the α-count method and the radon-thoron method of determining the total radioactive content of rocks and ores and have shown that there are no unknown, strong, α-emitting, radioactive elements in ordinary terrestrial materials. Certain mineral constituents allow a significant amount of their radiogenic He to escape during geologic time. The α-activity of 81 rock specimens has been found to range from 0·0 to 5·8 with an average of 1·23 α-rays/hr./mg.

550.93 1898

Determination of the helium content of terrestrial materials. GOODMAN, C., AND EVANS, R. D. *Rev. Sci. Instrum.*, 15, *pp.* 123–128, *May*, 1944.—With only minor modifications, the direct-fusion technique, as previously developed for emanation measurements, can also be employed to liberate He from terrestrial materials. The rock gases are purified, and the He is measured quantitatively with a sensitive McLeod gauge. In geological age studies of igneous rocks and non-radioactive minerals, the He contents ranged from $0{\cdot}25 \times 10^{-5}$ to 65×10^{-5} with modal and median values of $1{\cdot}8 \times 10^{-5}$ cm.^{3} He (at 0°C. and 76 cm. Hg) per g.

550.93 : 539.162 1899

Age of the earth according to radioactivity data. GERLING, E. K. *C.R. (Doklady) Acad. Sci. URSS*, 34, 9, *pp.* 259–261, 1942.—Previous estimations of the age of the earth from the content of radioactive elements in its crust are briefly reviewed. A new computation is given, based on the isotopic composition of leads of different age and origin [Abstr. 1936 (1941)]. The age of the earth is established as $< 3 \times 10^9$ to 4×10^9 years. A. E. T.

550.93 : 550.42 *see Abstr.* 1896

551.482.215 1900

The origin of curves in rivers. QURAISHY, M. S. *Curr. Sci.*, 13, *pp.* 36–39, *Feb.*, 1944.—The meandering of rivers has been studied experimentally in the laboratory. James Thomson's explanation, attributing the development of curves to secondary flow, is found to be correct so far as it goes. Curves arise even in a channel with straight sides and a very even bed; they originate owing to interactions between flowing water and sediment particles. J. S. G. T.

551.510.41 1901

Carbon dioxide content of atmospheric air. GLÜCKAUF, E. *Nature, Lond.*, 153, *pp.* 620–621, *May* 20, 1944.

551.521.1 1902

Filter measurements of solar radiation at Blue Hill Observatory. SCHULMAN, E. *Harv. Met. Stud., No.* 7, 68 *pp.*, 1943.—The Ångström method is used to deduce atmospheric turbidity coefficients from continuous recordings of normal-incidence solar

radiation made on an Eppley pyrheliometer in the period 1934–40. The yellow and red filters used to isolate 2 spectral regions for occasional readings deteriorated during the interval by crystallization at and below the surfaces, and empirical corrections are applied to allow for this. Comparison of the results with those obtained on a Smithsonian pyrheliometer shows day-to-day fluctuations of 2% or more which are ascribed to random observational errors. The distribution of steady atmospheric conditions during the day is related to convectional conditions. The solar radiation in the several spectral regions tends to a min. in the spring and a max. in the autumn, but there is no seasonal variation in the size of the scattering particles. Turbidity shows seasonal changes and variations with air-mass type. A. HU.

551.579.5 : 532.685 *see Abstr.* 1768

551.594.21 = 3 1903

Sign and field strength of field changes due to lightning. WICHMANN, H. *Beitr. Geophys.*, 59, 1, *pp.* 32–41, 1942.—Field changes caused by lightning discharges are registered by 3 methods of widely differing rate of response. 1 300 records are analysed with respect to the signs of the field changes and their variation with distance. Indications are purported to have been found, according to which Wilson's values of field changes are too small by a factor between 10 and 100. R. H. G.

551.594.21 = 3 1904

Pre-discharge fields and duration of field changes due to lightning. WICHMANN, H. *Beitr. Geophys.*, 59, 1, *pp.* 42–48, 1942.—From measurements of field changes due to lightning discharges by means of an earth plate, an aerial and a point-discharge recorder, comparatively slow field changes are found to precede some lightning discharges, particularly between clouds. The total durations of field changes are investigated and the results are subdivided according to storms with a predominance of cloud-cloud and cloud-earth flashes resp., and to the earlier and later phases of a thunderstorm. R. H. G.

551.594.21 = 3 1905

Field changes of lightning discharges between clouds and to earth. WICHMANN, H. *Beitr. Geophys.*, 59, 3–4, *pp.* 299–305, 1943.—Further registrations with the methods described [Abstr. 1904 (1944)] confirm the different types of field changes caused by cloud-cloud and cloud-earth strokes. The predominance of the two types of discharges in various storms and a possible history of an average storm are discussed. R. H. G.

551.594.221 1906

"Klydonogram" reproduced on golf green by lightning stroke. *Elect. Engng, N.Y.*, 63, *p.* 56, *Feb.*, 1944.—Lightning striking the smooth wet surface of a golf green burned a pattern into the grass, similar to that produced by pos. discharges in the klydonograph. R. H. G.

551.594.221 1907

Lightning. Measuring lightning current photographically. Equipment, procedure, and examples of results. FLOWERS, J. W. *Gen. Elect. Rev.*, 47, *pp.* 9–15, *April*, 1944.—The correlation is investigated which should exist between the density of a photographic record of a lightning stroke and the amplitude of the current discharged as recorded oscillographically. Simultaneous records obtained earlier at the Empire State Building are analysed, the method of determining the density of the negative, and the limitations involved, being discussed in detail. A new rotating camera with 4 lenses is developed to cover a great range of light intensity and a method is devised to determine the atmospheric light absorption in the intervening space. A single stroke which was recorded with the complete equipment is analysed. R. H. G.

551.594.221 : 77 1908

The photography of lightning. ALLIBONE, T. E. *Brit. J. Photogr. Alm.*, *pp.* 89–95, 1944.—It is shown how photographic methods, from the ordinary camera oscillated by hand to Boys' rotating camera, have proved the most important tool in providing present-day knowledge of the characteristics of the multiple lightning discharge and the mechanism of the leader and return stroke. Amateur photographers are advised of the value of photographs of lightning flashes as well as of damage caused by lightning. R. H. G.

576.311 : 591.175.4 : 532.13 *see Abstr.* 1758

577.15.022 : 541.124.2 *see Abstr.* 1842

578.083 : 535.434 *see Abstr.* 1802

578.084.1 1909

A closed-circuit apparatus for the measurement of respiratory metabolism. CHAPMAN, A., BALDES, E. J., AND HIGGINS, G. M. *Science*, 99, *pp.* 329–330, *April* 21, 1944.

578.087 1910

Mathematics of biological assay. WOOD, E. C. *Nature, Lond.*, 153, *pp.* 84–85, *Jan.* 15, *and pp.* 681–682, *June* 3, 1944.

581.4 : 591.4 : 51 *see Abstr.* 1726

591.111.4 = 4 1911

The temperature of living beings and the ionic composition of the cell media. BACHRACH, E. *Arch. Sci. Phys. Nat.*, 25, *pp.* 123–138, *July–Aug.*, 1943.—The characteristic upper and lower limits of biological temperatures have fluctuating values over wide ranges, and variation of biological properties with respect to temperature is regulated to a large extent by the cations, Na^+, K^+, Ca^{++}, Mg^{++}, contained in the cell media. These cations produce variations which are dependent on their nature and amount, while sugar (e.g. glucose) also has an important rôle in the resultant temperature effect. Data are included for mammals, birds, reptiles and fish, and an interesting set of comparative figures is given for a man and a horse. H. H. HO.

591.17 : 537.531.9 *see Abstr.* 1813

591.175.4 : 576.311 : 532.13 *see Abstr.* 1758

591.182 1912

Synaptic transmission in the spinal cord. ECCLES, J. C. *Nature, Lond.*, 153, *p.* 432, *April* 8, 1944.

591.4 : 581.4 : 51 *see Abstr.* 1726

612.85 : 519.283 : 534.77 *see Abstr.* 1782

629.135 : 771.313 *see Abstr.* 1921

632.94 1913

Action of inert dusts on insects. KALMUS, H. *Nature, Lond.*, 153, *pp.* 714–715, *June* 10, 1944.

637.1 : 541.144 *see Abstr.* 1859

662.231 : 541.124 *see Abstr.* 1839

663.632 1914

The chemical removal of salts from sea water to produce potable water. SPEALMAN, C. R. *Science*, 99, *pp.* 184–185, *March* 3, 1944.

663.632.6 1915

Desalting seawater. CALMON, C. *Yale Sci. Mag.*, 18, *pp.* 6–7 *and* 14, *March*, 1944.—A compact portable pint-size kit for emergency use operates on the ion-exchange principle. The seawater is agitated in a plastic bag with a small, highly compressed briquet of desalting compound of high capacity per unit wt. Reaction takes ~20 min., after which the suspended chemicals are removed by a built-in filter as the water is drawn off. Chemical details cannot at present be disclosed. N. M. B.

666.1 : 539.211 = 3 *see Abstr.* 1829

667.2 : 518.3 : 535.663 *see Abstr.* 1803

669.018 : 548.0 1916

Modern views on alloys and their possible application. HUME-ROTHERY, W. *J. Inst. Met.*, 70, *pp.* 229–273, *June*, 1944.—The metals between K and Cu in the table of the elements are considered, with sp. ref. to crystal structures, interatomic distances, and m.p. The cohesion rises to a max. in the region of Groups VI and VII, and the interpretation of this in terms of the electron theory of Pauling is discussed. The general effect of size-factor and electron conc. on the formation of solid solutions is described, leading to Jones's theory of the α/β-brass equilibrium. This theory at present applies only in the absence of lattice distortion, and it is shown that 2 kinds of lattice distortion have to be considered, one due to the valency electrons, and the other to the electron clouds of the ions. The effect of this on the solubilities of some elements in solid Cu is indicated. Characteristics of the theory of Mg alloys and Al alloys are discussed.

669.1 : 669.3 : 545.3 *see Abstr.* 1875

669.3 : 548.73 : 539.4.016.2 *see Abstr.* 1832

669.3 : 669.1 : 545.3 *see Abstr.* 1875

669.3 : 681 *see Abstr.* 1920

669.71 : 535.82 *see Abstr.* 1805

669.72 : 539.4.016 *see Abstr.* 1831

674.049 : 541.127.3 1917

Plywood bonding. GRINSFELDER, H., AND COLLINS, M. R. *Industr. Engng Chem.*, 36, *pp.* 152–159, *Feb.*, 1944.—Heat penetration measurements were made in plywood of various thicknesses placed between heated platens. The time necessary to cure the resin adhesive was established for 1 plywood construction and then calculated to correct for the difference between platen temp. and actual resin temp.; the rate of polymerization of the resin adhesive at different temperatures is thus determined. The reaction rate of the resin investigated appears to double with every 28 deg. F. rise. The bonding time for a particular construction is obtained from heat-penetration and rate-of-reaction curves by a modification of the Bryant method.

678 : 541.124 *see Abstr.* 1840, 1841

678 : 621.315.616 1918

Flex life and crystallization of synthetic rubber. FIELDING, J. H. *Industr. Engng Chem.*, 35, *pp.* 1259–1261, *Dec.*, 1943.—Natural rubber and Butyl B are similar in that stretching produces fibring; their flex life is good and high-tensile gum stocks are possible. GR-S and Buna N lack all semblance of fibring. Gum stocks have low tensile and, in general, flex life is poor.

679.56 1919

Borated resins. IRANY, E. P. *Industr. Engng Chem.*, 35, *pp.* 1290–1292, *Dec.*, 1943.—Boric acid reacts readily with macromolecular substances (cellulose esters and ethers and partially hydrolysed polyvinyl esters and acetals), which contain a plurality of hydroxyl groups per mol. The products are spatially linked, insoluble, infusible boric acid esters or ester-like association compounds. These compounds are hydrolysed by mere contact with water or alcohols and regenerate the original thermoplastic resin without change.

681 : 669.3 1920

Beryllium copper in instrument design. HUNT, L. B. *J. Sci. Instrum.*, 21, *pp.* 97–105, *June*, 1944.—The physical characteristics of Be Cu are described with particular reference to elastic properties. The usefulness of this alloy for instrument springs and similar parts is its combination of high elastic limit with low elastic modulus. The bearing of these and of other properties upon the problems of arriving at appropriate deflections and working stresses is discussed for the principal types of springs and pressure-responsive elements, namely, flat, helical and spiral springs, corrugated diaphragms, flexible bellows and Bourdon tubes. Brief details are given of the technique required for the fabrication and heat treatment.

691.11 : 543.812 *see Abstr.* 1874

77 : 551.594.221 *see Abstr.* 1908

771.313 : 629.135 1921

Instrument camera for aircraft. FIELD, R. H. *Canad. J. Res. F*, 22, *pp.* 29–38, *March*, 1944.—The camera is intended for photographing at regular predetermined intervals, or at desired instants, a number of instrument dials contained within the camera base. Records are made on 35 mm. film. Exposure is obtained by flashing lights, thus eliminating the need for a shutter. After each exposure the film is automatically reset.

778.3 1922

Some practical aspects of microphotography. STEVENS, G. W. W. *Photogr. J.*, 84, *pp* 108–111, *April*, 1944.—Discusses the construction, adjustment and operation of apparatus for microphotography, that is, the making of photographs so minute that a microscope is needed to view them. The practical problems encountered are discussed and a description is given of methods used to adapt available equipment to the making of small graticules. A. H.

778.55 : 534.862.3 *see Abstr.* 1784